



## **Cisco ONS 15454 SDH Reference Manual**

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<b>About this Guide</b>	<b>xxix</b>
Revision History	xxix
Document Objectives	xxx
Audience	xxx
Document Organization	xxx
Related Documentation	xxxi
Document Conventions	xxxi
Obtaining Optical Networking Information	xxxviii
Where to Find Safety and Warning Information	xxxviii
Cisco Optical Networking Product Documentation CD-ROM	xxxviii
Obtaining Documentation and Submitting a Service Request	xxxviii

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**CHAPTER 1**

<b>Shelf and FMEC Hardware</b>	<b>1-1</b>
1.1 Overview	1-1
1.2 Front Door	1-3
1.3 Front Mount Electrical Connection	1-7
1.4 E1-75/120 Conversion Panel	1-9
1.5 Coaxial Cable	1-10
1.6 Twisted-Pair Balanced Cable	1-10
1.7 Cable Routing and Management	1-11
1.8 Fiber Management	1-12
1.9 Fan-Tray Assembly	1-13
1.9.1 Fan Speed	1-14
1.9.2 Air Filter	1-14
1.10 Power and Ground Description	1-14
1.11 Alarm, Timing, LAN, and Craft Pin Connections	1-14
1.12 Cards and Slots	1-15
1.12.1 Card Slot Requirements	1-15
1.12.2 Card Replacement	1-18
1.13 Software and Hardware Compatibility	1-18

**CHAPTER 2**

**Common Control Cards 2-1**

- 2.1 Common Control Card Overview 2-1
  - 2.1.1 Card Summary 2-1
  - 2.1.2 Card Compatibility 2-2
  - 2.1.3 Cross-Connect Card Compatibility 2-3
- 2.2 TCC2 Card 2-4
  - 2.2.1 TCC2 Card Functionality 2-6
  - 2.2.2 TCC2 Card-Level Indicators 2-6
  - 2.2.3 Network-Level Indicators 2-7
- 2.3 TCC2P Card 2-7
  - 2.3.1 TCC2P Functionality 2-8
  - 2.3.2 TCC2P Card-Level Indicators 2-9
  - 2.3.3 Network-Level Indicators 2-10
- 2.4 XC10G Card 2-10
  - 2.4.1 XC10G Functionality 2-12
  - 2.4.2 XC10G Card-Level Indicators 2-12
- 2.5 XC-VXL-10G Card 2-12
  - 2.5.1 XC-VXL-10G Functionality 2-14
  - 2.5.2 XC-VXL-10G Card-Level Indicators 2-14
- 2.6 XC-VXL-2.5G Card 2-14
  - 2.6.1 XC-VXL-2.5G Card Functionality 2-16
  - 2.6.2 XC-VXL-2.5G Card-Level Indicators 2-16
- 2.7 AIC-I Card 2-16
  - 2.7.1 AIC-I Card-Level Indicators 2-17
  - 2.7.2 External Alarms and Controls 2-18
  - 2.7.3 Orderwire 2-19
  - 2.7.4 Power Monitoring 2-20
  - 2.7.5 User Data Channel 2-20
  - 2.7.6 Data Communications Channel 2-21

**CHAPTER 3**

**Electrical Cards 3-1**

- 3.1 Electrical Card Overview 3-1
  - 3.1.1 Card Summary 3-2
  - 3.1.2 Card Compatibility 3-4
- 3.2 E1-N-14 Card 3-4
  - 3.2.1 E1-N-14 Card Functionality 3-5
  - 3.2.2 E1-N-14 Card-Level Indicators 3-6
  - 3.2.3 E1-N-14 Port-Level Indicators 3-6

3.3	E1-42 Card	3-6
3.3.1	E1-42 Card Functionality	3-7
3.3.2	E1-42 Card-Level Indicators	3-8
3.3.3	E1-42 Port-Level Indicators	3-8
3.4	E3-12 Card	3-8
3.4.1	E3-12 Card Functionality	3-9
3.4.2	E3-12 Card-Level Indicators	3-10
3.4.3	E3-12 Port-Level Indicators	3-10
3.5	DS3i-N-12 Card	3-10
3.5.1	DS3i-N-12 Card Functionality	3-11
3.5.2	DS3i-N-12 Card-Level Indicators	3-12
3.5.3	DS3i-N-12 Port-Level Indicators	3-12
3.6	STM1E-12 Card	3-13
3.6.1	STM 1E-12 Card Functionality	3-13
3.6.2	STM1E-12 Card-Level Indicators	3-14
3.6.3	STM1E-12 Port-Level Indicators	3-14
3.7	BLANK Card	3-14
3.8	FMEC-E1 Card	3-15
3.9	FMEC-DS1/E1 Card	3-16
3.9.1	FMEC-DS1/E1 Card Connector Pinout	3-17
3.10	FMEC E1-120NP Card	3-18
3.10.1	FMEC E1-120NP Connector Pinout	3-19
3.11	FMEC E1-120PROA Card	3-21
3.11.1	FMEC E1-120PROA Connector Pinout	3-21
3.12	FMEC E1-120PROB Card	3-23
3.12.1	FMEC E1-120PROB Connector Pinout	3-24
3.13	E1-75/120 Impedance Conversion Panel	3-26
3.13.1	E1-75/120 Impedance Conversion Panel Functionality	3-28
3.14	FMEC-E3/DS3 Card	3-28
3.15	FMEC STM1E 1:1 Card	3-29
3.16	FMEC-BLANK Card	3-29
3.17	MIC-A/P FMEC	3-30
3.17.1	MIC-A/P Connector Pinouts	3-31
3.18	MIC-C/T/P FMEC	3-33
3.18.1	MIC-C/T/P Port-Level Indicators	3-34

**CHAPTER 4****Optical Cards 4-1**

4.1	Optical Card Overview	4-1
-----	-----------------------	-----

4.1.1	Card Summary	4-2
4.1.2	Card Compatibility	4-3
4.2	OC3 IR 4/STM1 SH 1310 Card	4-4
4.2.1	OC3 IR 4/STM1 SH 1310 Functionality	4-6
4.2.2	OC3 IR 4/STM1 SH 1310 Card-Level Indicators	4-7
4.2.3	OC3 IR 4/STM1 SH 1310 Port-Level Indicators	4-7
4.3	OC3 IR/STM1 SH 1310-8 Card	4-7
4.3.1	OC3 IR/STM1 SH 1310-8 Card-Level Indicators	4-10
4.3.2	OC3 IR/STM1 SH 1310-8 Port-Level Indicators	4-10
4.4	OC12 IR/STM4 SH 1310 Card	4-11
4.4.1	OC12 IR/STM4 SH 1310 Card-Level Indicators	4-12
4.4.2	OC12 IR/STM4 SH 1310 Port-Level Indicators	4-12
4.5	OC12 LR/STM4 LH 1310 Card	4-12
4.5.1	OC12 LR/STM4 LH 1310 Card-Level Indicators	4-14
4.5.2	OC12 LR/STM4 LH 1310 Port-Level Indicators	4-15
4.6	OC12 LR/STM4 LH 1550 Card	4-15
4.6.1	OC12 LR/STM4 LH 1550 Card Functionality	4-16
4.6.2	OC12 LR/STM4 LH 1550 Card-Level Indicators	4-17
4.6.3	OC12 LR/STM4 LH 1550 Port-Level Indicators	4-17
4.7	OC12 IR/STM4 SH 1310-4 Card	4-17
4.7.1	OC12 IR/STM4 SH 1310-4 Card Functionality	4-19
4.7.2	OC12 IR/STM4 SH 1310-4 Card-Level Indicators	4-20
4.7.3	OC12 IR/STM4 SH 1310-4 Port-Level Indicators	4-20
4.8	OC48 IR/STM16 SH AS 1310 Card	4-20
4.8.1	OC48 IR/STM16 SH AS 1310 Card Functionality	4-22
4.8.2	OC48 IR/STM16 SH AS 1310 Card-Level Indicators	4-22
4.8.3	OC48 IR/STM16 SH AS 1310 Port-Level Indicators	4-23
4.9	OC48 LR/STM16 LH AS 1550 Card	4-23
4.9.1	OC48 LR/STM16 LH AS 1550 Card Functionality	4-25
4.9.2	OC48 LR/STM16 LH AS 1550 Card-Level Indicators	4-25
4.9.3	OC48 LR/STM16 LH AS 1550 Port-Level Indicators	4-26
4.10	OC48 ELR/STM16 EH 100 GHz Cards	4-26
4.10.1	OC48 ELR/STM16 EH 100 GHz Card Functionality	4-28
4.10.2	OC48 ELR/STM16 EH 100 GHz Card-Level Indicators	4-29
4.10.3	OC48 ELR/STM16 EH 100 GHz Port-Level Indicators	4-29
4.11	OC192 SR/STM64 IO 1310 Card	4-29
4.11.1	OC192 SR/STM64 IO 1310 Card Functionality	4-31
4.11.2	OC192 SR/STM64 IO 1310 Card-Level Indicators	4-31
4.11.3	OC192 SR/STM64 IO 1310 Port-Level Indicators	4-32

4.12	OC192 IR/STM64 SH 1550 Card	4-32
4.12.1	OC192 IR/STM64 SH 1550 Card Functionality	4-34
4.12.2	OC192 IR/STM64 SH 1550 Card-Level Indicators	4-35
4.12.3	OC192 IR/STM64 SH 1550 Port-Level Indicators	4-35
4.13	OC192 LR/STM64 LH 1550 Card	4-35
4.13.1	OC192 LR/STM64 LH 1550 Card Functionality	4-37
4.13.2	OC192 LR/STM64 LH 1550 Card-Level Indicators	4-38
4.13.3	OC192 LR/STM64 LH 1550 Port-Level Indicators	4-38
4.14	OC192 LR/STM64 LH ITU 15xx.xx Card	4-39
4.14.1	OC192 LR/STM64 LH ITU 15xx.xx Card Functionality	4-40
4.14.2	OC192 LR/STM64 LH ITU 15xx.xx Card-Level Indicators	4-41
4.14.3	OC192 LR/STM64 LH ITU 15xx.xx Port-Level Indicators	4-41

**CHAPTER 5****Ethernet Cards 5-1**

5.1	Ethernet Card Overview	5-1
5.1.1	Cards Summary	5-2
5.1.2	Card Compatibility	5-2
5.2	E100T-G Card	5-2
5.2.1	E100T-G Slot Compatibility	5-4
5.2.2	E100T-G Card-Level Indicators	5-4
5.2.3	E100T-G Port-Level Indicators	5-4
5.3	E1000-2-G Card	5-4
5.3.1	E1000-2-G Compatibility	5-6
5.3.2	E1000-2-G Card-Level Indicators	5-6
5.3.3	E1000-2-G Port-Level Indicators	5-6
5.4	G1000-4 Card	5-7
5.4.1	G1000-4 Card-Level Indicators	5-8
5.4.2	G1000-4 Port-Level Indicators	5-8
5.4.3	G1000-4 Compatibility	5-8
5.5	G1K-4 Card	5-8
5.5.1	G1K-4 Compatibility	5-9
5.5.2	G1K-4 Card-Level Indicators	5-10
5.5.3	G1K-4 Port-Level Indicators	5-10
5.6	ML100T-12 Card	5-10
5.6.1	ML100T-12 Card-Level Indicators	5-11
5.6.2	ML100T-12 Port-Level Indicators	5-12
5.6.3	ML100T-12 Slot Compatibility	5-12
5.7	ML1000-2 Card	5-12
5.7.1	ML1000-2 Card-Level Indicators	5-13

- 5.7.2 ML1000-2 Port-Level Indicators 5-14
- 5.7.3 ML1000-2 Slot Compatibility 5-14
- 5.8 GBICs and SFPs 5-14
  - 5.8.1 Compatibility by Card 5-15
  - 5.8.2 GBIC Description 5-15
    - 5.8.2.1 DWDM and CWDM GBICs 5-16
  - 5.8.3 SFP Description 5-18

**CHAPTER 6**

**Storage Access Networking Cards 6-1**

- 6.1 FC\_MR-4 Card Overview 6-1
  - 6.1.1 FC\_MR-4 Card-Level Indicators 6-2
  - 6.1.2 FC\_MR-4 Port-Level Indicators 6-3
  - 6.1.3 FC\_MR-4 Compatibility 6-3
- 6.2 FC\_MR-4 Card Modes 6-3
  - 6.2.1 Line-Rate Card Mode 6-3
  - 6.2.2 Enhanced Card Mode 6-4
    - 6.2.2.1 Mapping 6-4
    - 6.2.2.2 SW-LCAS 6-4
  - 6.2.3 Distance Extension (Enhanced Mode Only) 6-4
  - 6.2.4 Interoperability Features (Enhanced Mode Only) 6-5
  - 6.2.5 Link Integrity 6-5
  - 6.2.6 Link Recovery 6-5
- 6.3 FC\_MR-4 Card Application 6-5

**CHAPTER 7**

**Card Protection 7-1**

- 7.1 Electrical Card Protection 7-1
  - 7.1.1 1:1 Protection 7-1
  - 7.1.2 1:N Protection 7-2
    - 7.1.2.1 Revertive Switching 7-3
    - 7.1.2.2 1:N Protection Guidelines 7-3
- 7.2 STM-N Card Protection 7-4
- 7.3 Unprotected Cards 7-4
- 7.4 External Switching Commands 7-5

**CHAPTER 8**

**Cisco Transport Controller Operation 8-1**

- 8.1 CTC Software Delivery Methods 8-1
  - 8.1.1 CTC Software Installed on the TCC2/TCC2P Card 8-1
  - 8.1.2 CTC Software Installed on the PC or UNIX Workstation 8-3



8.2	CTC Installation Overview	8-3
8.3	PC and UNIX Workstation Requirements	8-3
8.4	ONS 15454 SDH Connection	8-5
8.5	CTC Window	8-6
8.5.1	Node View	8-7
8.5.1.1	CTC Card Colors	8-7
8.5.1.2	Node View Card Shortcuts	8-10
8.5.1.3	Node View Tabs	8-10
8.5.2	Network View	8-11
8.5.3	Card View	8-13
8.6	TCC2/TCC2P Card Reset	8-15
8.7	TCC2/TCC2P Card Database	8-15
8.8	Software Revert	8-15

**CHAPTER 9****Security and Timing 9-1**

9.1	Users and Security	9-1
9.1.1	Security Requirements	9-1
9.1.2	Security Policies	9-5
9.1.2.1	Idle User Timeout	9-5
9.1.2.2	User Password, Login, and Access Policies	9-6
9.1.2.3	Audit Trail	9-6
9.2	Node Timing	9-7
9.2.1	Network Timing Example	9-7
9.2.2	Synchronization Status Messaging	9-8

**CHAPTER 10****Circuits and Tunnels 10-1**

10.1	Overview	10-1
10.2	Circuit Properties	10-2
10.2.1	Circuit Status	10-4
10.2.2	Circuit States	10-5
10.2.3	Circuit Protection Types	10-7
10.2.4	Circuit Information in the Edit Circuit Window	10-7
10.3	Cross-Connect Card Bandwidth	10-9
10.4	DCC Tunnels	10-10
10.4.1	Traditional DCC Tunnels	10-10
10.4.2	IP-Encapsulated Tunnels	10-11
10.5	Multiple Destinations for Unidirectional Circuits	10-12
10.6	Monitor Circuits	10-12

- 10.7 SNCP Circuits **10-12**
  - 10.7.1 Open-Ended SNCP Circuits **10-13**
  - 10.7.2 Go-and-Return SNCP Routing **10-13**
- 10.8 MS-SPRing Protection Channel Access Circuits **10-14**
- 10.9 Path Trace **10-15**
- 10.10 Path Signal Label, C2 Byte **10-15**
- 10.11 Automatic Circuit Routing **10-16**
  - 10.11.1 Bandwidth Allocation and Routing **10-17**
  - 10.11.2 Secondary Sources and Destinations **10-17**
- 10.12 Manual Circuit Routing **10-18**
- 10.13 Constraint-Based Circuit Routing **10-22**
- 10.14 Virtual Concatenated Circuits **10-22**
  - 10.14.1 VCAT Member Routing **10-22**
  - 10.14.2 Software-Link Capacity Adjustment **10-23**
  - 10.14.3 VCAT Circuit Size **10-23**
- 10.15 Merge Circuits **10-24**
- 10.16 Reconfigure Circuits **10-25**

**CHAPTER 11**

**SDH Topologies and Upgrades 11-1**

- 11.1 SDH Rings and TCC2/TCC2P Cards **11-1**
- 11.2 Multiplex Section-Shared Protection Rings **11-2**
  - 11.2.1 Two-Fiber MS-SPRings **11-2**
  - 11.2.2 Four-Fiber MS-SPRings **11-6**
  - 11.2.3 MS-SPRing Bandwidth **11-8**
  - 11.2.4 MS-SPRing Application Sample **11-10**
  - 11.2.5 MS-SPRing Fiber Connections **11-12**
  - 11.2.6 Two-Fiber MS-SPRing to Four-Fiber MS-SPRing Conversion **11-13**
- 11.3 Subnetwork Connection Protection **11-13**
- 11.4 Dual Ring Interconnect **11-18**
  - 11.4.1 MS-SPRing DRI **11-18**
  - 11.4.2 SNCP Dual Ring Interconnect **11-22**
  - 11.4.3 SNCP/MS-SPRing DRI Handoff Configurations **11-25**
- 11.5 Subtending Rings **11-26**
- 11.6 Linear ADM Configurations **11-28**
- 11.7 Extended SNCP Mesh Networks **11-29**
- 11.8 Four Node Configurations **11-31**
- 11.9 STM-N Speed Upgrades **11-31**

- 11.9.1 Span Upgrade Wizard 11-32
- 11.9.2 Manual Span Upgrades 11-32

**CHAPTER 12****CTC Network Connectivity 12-1**

- 12.1 IP Networking Overview 12-1
- 12.2 IP Addressing Scenarios 12-2
  - 12.2.1 Scenario 1: CTC and ONS 15454 SDH Nodes on Same Subnet 12-2
  - 12.2.2 Scenario 2: CTC and ONS 15454 SDH Nodes Connected to a Router 12-3
  - 12.2.3 Scenario 3: Using Proxy ARP to Enable an ONS 15454 SDH Gateway 12-4
  - 12.2.4 Scenario 4: Default Gateway on CTC Computer 12-6
  - 12.2.5 Scenario 5: Using Static Routes to Connect to LANs 12-7
  - 12.2.6 Scenario 6: Using OSPF 12-9
  - 12.2.7 Scenario 7: Provisioning the ONS 15454 SDH Proxy Server 12-11
  - 12.2.8 Scenario 8: Dual GNEs on a Subnet 12-17
  - 12.2.9 Scenario 9: IP Addressing with Secure Mode Enabled 12-19
- 12.3 Provisionable Patchcords 12-21
- 12.4 Routing Table 12-23
- 12.5 External Firewalls 12-25
- 12.6 Open GNE 12-27

**CHAPTER 13****Alarm Monitoring and Management 13-1**

- 13.1 Overview 13-1
- 13.2 Documenting Existing Provisioning 13-1
- 13.3 Viewing Alarm Counts on the LCD for a Node, Slot, or Port 13-2
- 13.4 Viewing Alarms 13-3
  - 13.4.1 Viewing Alarms With Each Node's Time Zone 13-5
  - 13.4.2 Controlling Alarm Display 13-5
  - 13.4.3 Filtering Alarms 13-5
  - 13.4.4 Viewing Alarm-Affected Circuits 13-6
  - 13.4.5 Conditions Tab 13-7
  - 13.4.6 Controlling the Conditions Display 13-7
    - 13.4.6.1 Retrieving and Displaying Conditions 13-7
    - 13.4.6.2 Conditions Column Descriptions 13-8
    - 13.4.6.3 Filtering Conditions 13-8
  - 13.4.7 Viewing History 13-8
    - 13.4.7.1 History Column Descriptions 13-9
    - 13.4.7.2 Retrieving and Displaying Alarm and Condition History 13-10
- 13.5 Alarm Severities 13-10

- 13.6 Alarm Profiles **13-10**
  - 13.6.1 Creating and Modifying Alarm Profiles **13-11**
  - 13.6.2 Alarm Profile Buttons **13-12**
  - 13.6.3 Alarm Profile Editing **13-12**
  - 13.6.4 Alarm Severity Options **13-12**
  - 13.6.5 Row Display Options **13-13**
  - 13.6.6 Applying Alarm Profiles **13-13**
- 13.7 Suppressing Alarms **13-14**
- 13.8 Provisioning External Alarms and Controls **13-15**
  - 13.8.1 External Alarm Input **13-15**
  - 13.8.2 External Control Output **13-15**
- 13.9 Audit Trail **13-16**
  - 13.9.1 Audit Trail Log Entries **13-16**
  - 13.9.2 Audit Trail Capacities **13-16**

**CHAPTER 14**

**Ethernet Operation 14-1**

- 14.1 G-Series Application **14-1**
  - 14.1.1 G1K-4 and G1000-4 Comparison **14-2**
  - 14.1.2 G-Series Example **14-2**
  - 14.1.3 IEEE 802.3z Flow Control and Frame Buffering **14-3**
  - 14.1.4 Ethernet Link Integrity Support **14-4**
  - 14.1.5 Gigabit EtherChannel/IEEE 802.3ad Link Aggregation **14-4**
- 14.2 G-Series Gigabit Ethernet Transponder Mode **14-5**
  - 14.2.1 Two-Port Bidirectional Transponder **14-7**
  - 14.2.2 One-Port Bidirectional Transponder **14-8**
  - 14.2.3 Two-Port Unidirectional Transponder **14-8**
  - 14.2.4 G-Series Transponder Mode Characteristics **14-9**
- 14.3 E-Series Application **14-10**
  - 14.3.1 E-Series Modes **14-10**
    - 14.3.1.1 E-Series Multicard EtherSwitch Group **14-10**
    - 14.3.1.2 E-Series Single-Card EtherSwitch **14-11**
    - 14.3.1.3 Port-Mapped (Linear Mapper) **14-11**
  - 14.3.2 E-Series IEEE 802.3z Flow Control **14-12**
  - 14.3.3 E-Series VLAN Support **14-13**
  - 14.3.4 E-Series Q-Tagging (IEEE 802.1Q) **14-13**
  - 14.3.5 E-Series Priority Queuing (IEEE 802.1Q) **14-15**
  - 14.3.6 E-Series Spanning Tree (IEEE 802.1D) **14-16**
    - 14.3.6.1 E-Series Multi-Instance Spanning Tree and VLANs **14-17**
    - 14.3.6.2 Spanning Tree on a Circuit-by-Circuit Basis **14-18**

14.3.6.3	E-Series Spanning Tree Parameters	14-18
14.3.6.4	E-Series Spanning Tree Configuration	14-18
14.4	G-Series Circuit Configurations	14-19
14.4.1	G-Series Point-to-Point Ethernet Circuits	14-19
14.4.2	G-Series Manual Cross-Connects	14-19
14.5	E-Series Circuit Configurations	14-20
14.5.1	Port-Mapped Mode and Single-card EtherSwitch Circuit Scenarios	14-20
14.5.2	E-Series Point-to-Point Ethernet Circuits	14-21
14.5.3	E-Series Shared Packet Ring Ethernet Circuits	14-22
14.5.4	E-Series Hub-and-Spoke Ethernet Circuit Provisioning	14-22
14.5.5	E-Series Ethernet Manual Cross-Connects	14-23
14.6	Remote Monitoring Specification Alarm Thresholds	14-23

**APPENDIX A****Hardware Specifications A-1**

A.1	Shelf Specifications	A-1
A.1.1	Bandwidth	A-1
A.1.2	Configurations	A-1
A.1.3	Cisco Transport Controller	A-2
A.1.4	External LAN Interface	A-2
A.1.5	Alarm Interface	A-2
A.1.6	Database Storage	A-2
A.1.7	Timing Interface	A-2
A.1.8	System Timing	A-3
A.1.9	System Power	A-3
A.1.10	System Environmental Specifications	A-3
A.1.11	Dimensions	A-3
A.2	SFP Specifications	A-3
A.3	General Card Specifications	A-4
A.3.1	Power Consumption	A-4
A.3.2	Temperature Ranges	A-6
A.4	Common Control Card Specifications	A-8
A.4.1	TCC2 Card Specifications	A-8
A.4.2	TCC2P Card Specifications	A-8
A.4.3	XC10G Card Specifications	A-9
A.4.4	XC-VXL-10G Card Specifications	A-10
A.4.5	XC-VXL-2.5G Card Specifications	A-10
A.4.6	AIC-I Specifications	A-10
A.5	Electrical Card and FMEC Specifications	A-12
A.5.1	E1-N-14 Card Specifications	A-12

A.5.2	E1-42 Card Specifications	A-13
A.5.3	E3-12 Card Specifications	A-14
A.5.4	DS3i-N-12 Card Specifications	A-15
A.5.5	STM1E-12 Card Specifications	A-16
A.5.6	BLANK Card	A-17
A.5.7	FMEC-E1 Specifications	A-17
A.5.8	FMEC-DS1/E1 Card Specifications	A-18
A.5.9	FMEC E1-120NP Card Specifications	A-18
A.5.10	FMEC E1-120PROA Card Specifications	A-19
A.5.11	FMEC E1-120PROB Card Specifications	A-20
A.5.12	E1-75/120 Impedance Conversion Panel Specifications	A-21
A.5.13	FMEC-E3/DS3 Card Specifications	A-21
A.5.14	FMEC STM1E 1:1 Card Specifications	A-23
A.5.15	FMEC-BLANK Card Specifications	A-24
A.5.16	MIC-A/P Card Specifications	A-24
A.5.17	MIC-C/T/P Card Specifications	A-25
A.6	Optical Card Specifications	A-26
A.6.1	OC3 IR 4/STM1 SH 1310 Card Specifications	A-26
A.6.2	OC3 IR/STM1 SH 1310-8 Card Specifications	A-27
A.6.3	OC12 IR/STM4 SH 1310 Card Specifications	A-28
A.6.4	OC12 LR/STM4 LH 1310 Card Specifications	A-29
A.6.5	OC12 LR/STM4 LH 1550 Card Specifications	A-29
A.6.6	OC12 IR/STM4 SH 1310-4 Card Specifications	A-30
A.6.7	OC48 IR/STM16 SH AS 1310 Card Specifications	A-31
A.6.8	OC48 LR/STM16 LH AS 1550 Card Specifications	A-32
A.6.9	OC48 ELR/STM16 EH 100 GHz Card Specifications	A-33
A.6.10	OC192 SR/STM64 IO 1310 Card Specifications	A-34
A.6.11	OC192 IR/STM64 SH 1550 Card Specifications	A-35
A.6.12	OC192 LR/STM64 LH 1550 Card Specifications	A-36
A.6.13	OC192 LR/STM64 LH ITU 15xx.xx Card Specifications	A-38
A.7	Ethernet Card Specifications	A-39
A.7.1	E100T-G Card Specifications	A-39
A.7.2	E1000-2-G Card Specifications	A-40
A.7.3	G1000-4 Card Specifications	A-40
A.7.4	G1K-4 Card Specifications	A-41
A.7.5	ML100T-12 Card Specifications	A-41
A.7.6	ML1000-2 Card Specifications	A-42
A.8	Storage Access Networking Card Specifications	A-42
A.8.1	FC_MR-4 Card Specifications	A-42

**APPENDIX B****Administrative and Service States B-1**

- B.1 Service States **B-1**
- B.2 Administrative States **B-2**
- B.3 Service State Transitions **B-3**
  - B.3.1 Card Service State Transitions **B-3**
  - B.3.2 Port and Cross-Connect Service State Transitions **B-5**

**APPENDIX C****Network Element Defaults C-1**

- C.1 Network Element Defaults Description **C-1**
- C.2 Card Default Settings **C-1**
  - C.2.1 E1 Card Default Settings **C-3**
  - C.2.2 E1-42 Card Default Settings **C-4**
  - C.2.3 E3 Card Default Settings **C-6**
  - C.2.4 FC\_MR-4 Card Default Settings **C-8**
  - C.2.5 DS3I Card Default Settings **C-8**
  - C.2.6 Data Card Default Settings **C-11**
  - C.2.7 STM1 Card Default Settings **C-11**
  - C.2.8 STM1-8 Card Default Settings **C-13**
  - C.2.9 STM1E-12 Card Default Settings **C-16**
  - C.2.10 STM4 Card Default Settings **C-18**
  - C.2.11 STM4-4 Card Default Settings **C-20**
  - C.2.12 STM16 Card Default Settings **C-22**
  - C.2.13 STM64 Card Default Settings **C-25**
  - C.2.14 MXP\_2.5G\_10G Card Default Settings **C-27**
  - C.2.15 MXP\_2.5G\_10E Card Default Settings **C-31**
  - C.2.16 MXP\_MR\_2.5G Card Default Settings **C-35**
  - C.2.17 MXPP\_MR\_2.5G Card Default Settings **C-38**
  - C.2.18 TXP\_MR\_10E Card Default Settings **C-41**
  - C.2.19 TXP\_MR\_10G Card Default Settings **C-45**
  - C.2.20 TXP\_MR\_2.5G Card Default Settings **C-50**
  - C.2.21 TXPP\_MR\_10G Card Default Settings **C-56**
  - C.2.22 OSCM Card Default Settings **C-63**
  - C.2.23 OSC-CSM Card Default Settings **C-64**
- C.3 Node Default Settings **C-65**
- C.4 CTC Default Settings **C-68**

**INDEX**







<i>Figure 1-1</i>	<a href="#">ONS 15454 SDH Dimensions</a>	<b>1-3</b>
<i>Figure 1-2</i>	<a href="#">The ONS 15454 SDH Front Door</a>	<b>1-4</b>
<i>Figure 1-3</i>	<a href="#">Removing the ONS 15454 SDH Front Door</a>	<b>1-5</b>
<i>Figure 1-4</i>	<a href="#">Front-Door Erasable Label</a>	<b>1-6</b>
<i>Figure 1-5</i>	<a href="#">Laser Warning on the Front-Door Label</a>	<b>1-7</b>
<i>Figure 1-6</i>	<a href="#">Mounting the E1-75/120 Conversion Panel in a Rack</a>	<b>1-10</b>
<i>Figure 1-7</i>	<a href="#">Managing Cables on the Front Panel</a>	<b>1-11</b>
<i>Figure 1-8</i>	<a href="#">Fiber Capacity</a>	<b>1-12</b>
<i>Figure 1-9</i>	<a href="#">Position of the Fan-Tray Assembly</a>	<b>1-13</b>
<i>Figure 1-10</i>	<a href="#">Installing Cards in the ONS 15454 SDH</a>	<b>1-15</b>
<i>Figure 2-1</i>	<a href="#">TCC2 Faceplate and Block Diagram</a>	<b>2-5</b>
<i>Figure 2-2</i>	<a href="#">TCC2P Faceplate and Block Diagram</a>	<b>2-8</b>
<i>Figure 2-3</i>	<a href="#">XC10G Card Faceplate and Block Diagram</a>	<b>2-11</b>
<i>Figure 2-4</i>	<a href="#">XC10G Card Cross-Connect Matrix</a>	<b>2-11</b>
<i>Figure 2-5</i>	<a href="#">XC-VXL-10G Faceplate and Block Diagram</a>	<b>2-13</b>
<i>Figure 2-6</i>	<a href="#">XC-VXL-10G Cross-Connect Matrix</a>	<b>2-13</b>
<i>Figure 2-7</i>	<a href="#">XC-VXL-2.5G Faceplate and Block Diagram</a>	<b>2-15</b>
<i>Figure 2-8</i>	<a href="#">XC-VXL-2.5G Cross-Connect Matrix</a>	<b>2-15</b>
<i>Figure 2-9</i>	<a href="#">AIC-I Faceplate and Block Diagram</a>	<b>2-17</b>
<i>Figure 2-10</i>	<a href="#">RJ-11 Cable Connector</a>	<b>2-20</b>
<i>Figure 3-1</i>	<a href="#">E1-N-14 Faceplate and Block Diagram</a>	<b>3-5</b>
<i>Figure 3-2</i>	<a href="#">E1-42 Faceplate and Block Diagram</a>	<b>3-7</b>
<i>Figure 3-3</i>	<a href="#">E3-12 Card Faceplate and Block Diagram</a>	<b>3-9</b>
<i>Figure 3-4</i>	<a href="#">DS3i-N-12 Faceplate and Block Diagram</a>	<b>3-11</b>
<i>Figure 3-5</i>	<a href="#">STM1E-12 Faceplate and Block Diagram</a>	<b>3-13</b>
<i>Figure 3-6</i>	<a href="#">FILLER Faceplate</a>	<b>3-15</b>
<i>Figure 3-7</i>	<a href="#">FMEC-E1 Faceplate and Block Diagram</a>	<b>3-16</b>
<i>Figure 3-8</i>	<a href="#">FMEC-DS1/E1 Faceplate and Block Diagram</a>	<b>3-16</b>
<i>Figure 3-9</i>	<a href="#">FMEC E1-120NP Faceplate and Block Diagram</a>	<b>3-19</b>
<i>Figure 3-10</i>	<a href="#">FMEC E1-120PROA Faceplate and Block Diagram</a>	<b>3-21</b>
<i>Figure 3-11</i>	<a href="#">FMEC E1-120PROB Faceplate and Block Diagram</a>	<b>3-24</b>

Figure 3-12	E1-75/120 Impedance Conversion Panel Faceplate	3-26
Figure 3-13	E1-75/120 with Optional Rackmount Brackets	3-27
Figure 3-14	E1-75/120 Impedance Conversion Panel Block Diagram	3-27
Figure 3-15	FMEC-E3/DS3 Faceplate and Block Diagram	3-28
Figure 3-16	FMEC STM1E 1:1 Faceplate and Block Diagram	3-29
Figure 3-17	FMEC-BLANK Faceplate	3-30
Figure 3-18	MIC-A/P Faceplate and Block Diagram	3-30
Figure 3-19	MIC-C/T/P Faceplate and Block Diagram	3-33
Figure 4-1	OC3 IR 4/STM1 SH 1310 Faceplate	4-5
Figure 4-2	OC3 IR 4/STM1 SH 1310 Block Diagram	4-6
Figure 4-3	OC3 IR/STM1 SH 1310-8 Faceplate	4-8
Figure 4-4	OC3 IR/STM1 SH 1310-8 Block Diagram	4-9
Figure 4-5	OC12 IR/STM4 SH 1310 Faceplate and Block Diagram	4-11
Figure 4-6	OC12 LR/STM4 LH 1310 Faceplate	4-13
Figure 4-7	OC12 LR/STM4 LH 1310 Block Diagram	4-14
Figure 4-8	OC12 LR/STM4 LH 1550 Faceplate and Block Diagram	4-16
Figure 4-9	OC12 IR/STM4 SH 1310-4 Faceplate	4-18
Figure 4-10	OC12 IR/STM4 SH 1310-4 Block Diagram	4-19
Figure 4-11	OC48 IR/STM16 SH AS 1310 Faceplate	4-21
Figure 4-12	OC48 IR/STM16 SH AS 1310 Block Diagram	4-22
Figure 4-13	OC48 LR/STM16 LH AS 1550 Faceplate	4-24
Figure 4-14	OC48 LR/STM16 LH AS 1550 Block Diagram	4-25
Figure 4-15	OC48 ELR/STM16 EH 100 GHz Faceplate	4-27
Figure 4-16	OC48 ELR/STM16 EH 100 GHz Block Diagram	4-28
Figure 4-17	OC192 SR/STM64 IO 1310 Faceplate	4-30
Figure 4-18	OC192 SR/STM64 IO 1310 Block Diagram	4-31
Figure 4-19	OC192 IR/STM64 SH 1550 Faceplate	4-33
Figure 4-20	OC192 IR/STM64 SH 1550 Block Diagram	4-34
Figure 4-21	OC192 LR/STM64 LH 1550 Faceplate and Block Diagram	4-36
Figure 4-22	Enlarged Section of the OC192 LR/STM64 LH 1550 Faceplate	4-37
Figure 4-23	OC192 LR/STM64 LH ITU 15xx.xx Faceplate	4-39
Figure 4-24	OC192 LR/STM64 LH ITU 15xx.xx Block Diagram	4-40
Figure 5-1	E100T-G Faceplate and Block Diagram	5-3
Figure 5-2	E1000-2-G Faceplate and Block Diagram	5-5
Figure 5-3	G1000-4 Faceplate and Block Diagram	5-7

Figure 5-4	G1K-4 Faceplate and Block Diagram	5-9
Figure 5-5	ML100T-12 Faceplate	5-11
Figure 5-6	ML1000-2 Faceplate	5-13
Figure 5-7	GBICs with Clips (left) and with a Handle (right)	5-16
Figure 5-8	CWDM GBIC with Wavelength Appropriate for Fiber-Connected Device	5-17
Figure 5-9	G-Series with CWDM/DWDM GBICs in Cable Network	5-18
Figure 5-10	Mylar Tab SFP	5-18
Figure 5-11	Actuator/Button SFP	5-19
Figure 5-12	Bail Clasp SFP	5-19
Figure 6-1	FC_MR-4 Faceplate and Block Diagram	6-2
Figure 7-1	ONS 15454 SDH Cards in a 1:1 Protection Configuration	7-2
Figure 7-2	ONS 15454 SDH Cards in a 1:N Protection Configuration	7-3
Figure 7-3	ONS 15454 SDH Cards in an Unprotected Configuration	7-5
Figure 8-1	CTC Software Versions, Node View	8-2
Figure 8-2	CTC Software Versions, Network View	8-2
Figure 8-3	Node View (Default Login View)	8-7
Figure 8-4	Terminal Loopback Indicator	8-9
Figure 8-5	Facility Loopback Indicator	8-9
Figure 8-6	Network in CTC Network View	8-11
Figure 8-7	Card View	8-13
Figure 9-1	ONS 15454 SDH Timing Example	9-8
Figure 10-1	ONS 15454 SDH Circuit Window in Network View	10-4
Figure 10-2	Terminal Loopback in the Edit Circuits Window	10-9
Figure 10-3	Traditional DCC Tunnel	10-11
Figure 10-4	VC4 Monitor Circuit Received at an STM-1 Port	10-12
Figure 10-5	SNCP Go-and-Return Routing	10-14
Figure 10-6	Secondary Sources and Destinations	10-17
Figure 10-7	Alternate Paths for Virtual SNCP Segments	10-18
Figure 10-8	Mixing 1+1 or MS-SPRing Protected Links with an SNCP	10-19
Figure 10-9	Ethernet Shared Packet Ring Routing	10-19
Figure 10-10	Ethernet and SNCP	10-20
Figure 10-11	VCAT Common Fiber Routing	10-23
Figure 11-1	Four-Node, Two-Fiber MS-SPRing	11-3
Figure 11-2	Four-Node, Two-Fiber MS-SPRing Traffic Pattern	11-4
Figure 11-3	Four-Node, Two-Fiber MS-SPRing Traffic Pattern After Line Break	11-5

Figure 11-4	Four-Node, Four-Fiber MS-SPRing	11-6
Figure 11-5	Four-Fiber MS-SPRing Span Switch	11-7
Figure 11-6	Four-Fiber MS-SPRing Switch	11-8
Figure 11-7	MS-SPRing Bandwidth Reuse	11-9
Figure 11-8	Five-Node, Two-Fiber MS-SPRing	11-10
Figure 11-9	Shelf Assembly Layout for Node 0 in Figure 11-8	11-11
Figure 11-10	Shelf Assembly Layout for Nodes 1 to 4 in Figure 11-8	11-11
Figure 11-11	Connecting Fiber to a Four-Node, Two-Fiber MS-SPRing	11-12
Figure 11-12	Connecting Fiber to a Four-Node, Four-Fiber MS-SPRing	11-13
Figure 11-13	Basic Four-Node SNCP Ring	11-14
Figure 11-14	SNCP Ring with a Fiber Break	11-15
Figure 11-15	STM-1 SNCP Ring	11-16
Figure 11-16	Card Setup of Node A in the STM-1 SNCP Ring Example	11-17
Figure 11-17	Card Setup of Nodes B-D in the STM-1 SNCP Ring Example	11-17
Figure 11-18	ONS 15454 SDH Traditional MS-SPRing Dual Ring Interconnect (Same-Side Routing)	11-19
Figure 11-19	ONS 15454 SDH Traditional MS-SPRing Dual Ring Interconnect (Opposite-Side Routing)	11-20
Figure 11-20	ONS 15454 SDH Integrated MS-SPRing Dual Ring Interconnect	11-21
Figure 11-21	ONS 15454 Traditional SDH Dual Ring Interconnect	11-23
Figure 11-22	ONS 15454 SDH Integrated Dual Ring Interconnect	11-24
Figure 11-23	ONS 15454 SDH SNCP to MS-SPRing Traditional DRI Handoff	11-25
Figure 11-24	ONS 15454 SDH SNCP to MS-SPRing Integrated DRI Handoff	11-26
Figure 11-25	ONS 15454 SDH with Multiple Subtending Rings	11-27
Figure 11-26	SNCP Ring Subtending from an MS-SPRing	11-27
Figure 11-27	MS-SPRing Subtending from an MS-SPRing	11-28
Figure 11-28	Linear (Point-to-Point) ADM Configuration	11-29
Figure 11-29	Extended SNCP Mesh Network	11-30
Figure 11-30	Extended SNCP Virtual Ring	11-30
Figure 12-1	Scenario 1: CTC and ONS 15454 SDH Nodes on the Same Subnet	12-3
Figure 12-2	Scenario 2: CTC and ONS 15454 SDH Nodes Connected to Router	12-4
Figure 12-3	Scenario 3: Using Proxy ARP	12-5
Figure 12-4	Scenario 3: Using Proxy ARP with Static Routing	12-6
Figure 12-5	Scenario 4: Default Gateway on a CTC Computer	12-7
Figure 12-6	Scenario 5: Static Route With One CTC Computer Used as a Destination	12-8
Figure 12-7	Scenario 5: Static Route With Multiple LAN Destinations	12-9
Figure 12-8	Scenario 6: OSPF Enabled	12-10

Figure 12-9	Scenario 6: OSPF Not Enabled	12-11
Figure 12-10	Proxy Server Gateway Settings	12-13
Figure 12-11	Scenario 7: SDH Proxy Server with GNE and ENes on the Same Subnet	12-14
Figure 12-12	Scenario 7: ONS 15454 SDH Proxy Server with GNE and ENes on Different Subnets	12-15
Figure 12-13	Scenario 7: ONS 15454 SDH Proxy Server With ENes on Multiple Rings	12-16
Figure 12-14	Scenario 8: Dual GNEs on the Same Subnet	12-18
Figure 12-15	Scenario 8: Dual GNEs on Different Subnets	12-19
Figure 12-16	Scenario 9: ONS 15454 SDH GNE and ENes on the Same Subnet with Secure Mode Enabled	12-20
Figure 12-17	Scenario 9: ONS 15454 SDH GNE and ENes on Different Subnets with Secure Mode Enabled	12-21
Figure 12-18	Proxy and Firewall Tunnels for Foreign Terminations	12-28
Figure 12-19	Foreign Node Connection to an ENE Ethernet Port	12-29
Figure 13-1	Shelf LCD Panel	13-3
Figure 13-2	Select Affected Circuits Option	13-6
Figure 13-3	Viewing Alarm-Affected Circuits	13-6
Figure 13-4	Card View Port Alarm Profile for an OPT-BST Card	13-14
Figure 14-1	Data Traffic on a G-Series Point-to-Point Circuit	14-2
Figure 14-2	End-to-End Ethernet Link Integrity Support	14-4
Figure 14-3	G-Series Gigabit EtherChannel (GEC) Support	14-5
Figure 14-4	Card Level Overview of G-Series One Port Transponder Mode Application	14-6
Figure 14-5	G-Series in Default SDH Mode	14-6
Figure 14-6	G-Series Card in Transponder Mode (Two-Port Bidirectional)	14-7
Figure 14-7	One-Port Bidirectional Transponding Mode	14-8
Figure 14-8	Two-Port Unidirectional Transponder	14-9
Figure 14-9	Multicard EtherSwitch Configuration	14-11
Figure 14-10	Single-Card EtherSwitch Configuration	14-11
Figure 14-11	E-Series Mapping Ethernet Ports To SDH STM Circuits	14-12
Figure 14-12	Q-Tag Moving through VLAN	14-14
Figure 14-13	Priority Queuing Process	14-15
Figure 14-14	An STP Blocked Path	14-16
Figure 14-15	Spanning Tree Map on the Circuit Window	14-17
Figure 14-16	G-Series Point-to-Point Circuit	14-19
Figure 14-17	G-Series Manual Cross-Connects	14-20
Figure 14-18	Multicard EtherSwitch Point-to-Point Circuit	14-21
Figure 14-19	Single-Card EtherSwitch or Port-Mapped Point-to-Point Circuit	14-21
Figure 14-20	Shared Packet Ring Ethernet Circuit	14-22

Figure 14-21      [Hub-and-Spoke Ethernet Circuit](#)    14-23



<i>Table 1</i>	Cisco ONS 15454 SDH Reference Manual Chapters	xxx
<i>Table 1-1</i>	Slot and FMEC Symbols	1-8
<i>Table 1-2</i>	FMEC, Ports, Line Rates, and Connectors	1-8
<i>Table 1-3</i>	Fiber Channel Capacity (One Side of the Shelf)	1-12
<i>Table 1-4</i>	Slot and Card Symbols	1-16
<i>Table 1-5</i>	Card Ports, Line Rates, and Connectors	1-16
<i>Table 1-6</i>	ONS 15454 SDH Software Release/Hardware Compatibility—XC-VXL-2.5G Configurations	1-18
<i>Table 1-7</i>	ONS 15454 SDH Software Release/Hardware Compatibility—XC10G and XC-VXL-10G Configurations	1-19
<i>Table 2-1</i>	Common Control Cards for the ONS 15454 SDH	2-2
<i>Table 2-2</i>	Common-Control Card Software Release Compatibility	2-2
<i>Table 2-3</i>	Common-Control Card Cross-Connect Compatibility	2-3
<i>Table 2-4</i>	Electrical Card Cross-Connect Compatibility	2-3
<i>Table 2-5</i>	Optical Card Cross-Connect Compatibility	2-4
<i>Table 2-6</i>	Ethernet Card Cross-Connect Compatibility	2-4
<i>Table 2-7</i>	TCC2 Card-Level Indicators	2-7
<i>Table 2-8</i>	TCC2 Network-Level Indicators	2-7
<i>Table 2-9</i>	TCC2P Card-Level Indicators	2-9
<i>Table 2-10</i>	TCC2P Network-Level Indicators	2-10
<i>Table 2-11</i>	XC10G Card-Level Indicators	2-12
<i>Table 2-12</i>	XC-VXL-10G Card-Level Indicators	2-14
<i>Table 2-13</i>	XC-VXL-2.5G Card-Level Indicators	2-16
<i>Table 2-14</i>	AIC-I Card-Level Indicators	2-17
<i>Table 2-15</i>	Orderwire Pin Assignments	2-20
<i>Table 2-16</i>	UDC Pin Assignments	2-20
<i>Table 2-17</i>	GCC Pin Assignments	2-21
<i>Table 3-1</i>	Electrical Cards	3-2
<i>Table 3-2</i>	Electrical Card Software Release Compatibility	3-4
<i>Table 3-3</i>	E1-N-14 Card-Level Indicators	3-6
<i>Table 3-4</i>	E1-42 Card-Level Indicators	3-8
<i>Table 3-5</i>	E3-12 Card-Level Indicators	3-10
<i>Table 3-6</i>	DS3i-N-12 Card-Level Indicators	3-12

Table 3-7	STM1E-12 Card-Level Indicators	3-14
Table 3-8	E-1 Interface Pinouts on Ports 1 to 7	3-17
Table 3-9	E-1 Interface Pinouts on Ports 8 to 14	3-17
Table 3-10	E-1 Interface Pinouts on Ports 1 to 21	3-19
Table 3-11	E-1 Interface Pinouts on Ports 22 to 42	3-20
Table 3-12	E-1 Interface Pinouts on Ports 1 to 21	3-22
Table 3-13	E-1 Interface Pinouts on Ports 22 to 42	3-22
Table 3-14	E-1 Interface Pinouts on Ports 1 to 21	3-24
Table 3-15	E-1 Interface Pinouts on Ports 22 to 42	3-25
Table 3-16	Alarm Interface Pinouts on the MIC-A/P DB-62 Connector	3-31
Table 4-1	Optical Cards for the ONS 15454 SDH	4-2
Table 4-2	Optical Card Software Release Compatibility	4-3
Table 4-3	OC3 IR/STM1 SH 1310 Card-Level Indicators	4-7
Table 4-4	OC3IR/STM1 SH 1310-8 Card-Level Indicators	4-10
Table 4-5	OC12 IR/STM4 SH 1310 Card-Level Indicators	4-12
Table 4-6	OC12 LR/STM4 LH 1310 Card-Level Indicators	4-14
Table 4-7	OC12 LR/STM4 LH 1550 Card-Level Indicators	4-17
Table 4-8	OC12 IR/STM4 SH 1310-4 Card-Level Indicators	4-20
Table 4-9	OC48 IR/STM16 SH AS 1310 Card-Level Indicators	4-22
Table 4-10	OC48 LR/STM16 LH AS 1550 Card-Level Indicators	4-25
Table 4-11	OC48 ELR Card-Level Indicators	4-29
Table 4-12	OC192 SR/STM64 IO 1310 Card-Level Indicators	4-32
Table 4-13	OC192 IR/STM64 SH 1550 Card-Level Indicators	4-35
Table 4-14	OC192 LR/STM64 LH 1550 Card-Level Indicators	4-38
Table 4-15	OC192 LR/STM64 LH ITU 15xx.xx Card-Level Indicators	4-41
Table 5-1	Ethernet Cards for the ONS 15454 SDH	5-2
Table 5-2	Ethernet Card Software Compatibility	5-2
Table 5-3	E100T-G Card-Level Indicators	5-4
Table 5-4	E100T-G Port-Level Indicators	5-4
Table 5-5	E1000-2-G Card-Level Indicators	5-6
Table 5-6	E1000-2-G Port-Level Indicators	5-6
Table 5-7	G1000-4 Card-Level Indicators	5-8
Table 5-8	G1000-4 Port-Level Indicators	5-8
Table 5-9	G1K-4 Card-Level Indicators	5-10
Table 5-10	G1K-4 Port-Level Indicators	5-10



Table 5-11	ML100T-12 Card-Level Indicators	5-12
Table 5-12	ML100T-12 Port-Level Indicators	5-12
Table 5-13	ML1000-2 Card-Level Indicators	5-14
Table 5-14	ML1000-2 Port-Level Indicators	5-14
Table 5-15	GBIC and SFP Card Compatibility	5-15
Table 5-16	Supported Wavelengths for CWDM GBICs	5-17
Table 5-17	Supported Wavelengths for DWDM GBICs	5-17
Table 6-1	FC_MR-4 Card-Level Indicators	6-2
Table 8-1	JRE Compatibility	8-4
Table 8-2	CTC Computer Requirements	8-4
Table 8-3	ONS 15454 SDH Connection Methods	8-6
Table 8-4	Node View Card Colors	8-7
Table 8-5	Node View FMEC Color	8-8
Table 8-6	Node View Card Port Colors and Service States	8-8
Table 8-7	Node View Card States	8-9
Table 8-8	Node View Port Graphics	8-10
Table 8-9	Node View Tabs and Subtabs	8-10
Table 8-10	Node Status Shown in Network View	8-12
Table 8-11	Network View Tabs and Subtabs	8-12
Table 8-12	Card View Tabs and Subtabs	8-14
Table 9-1	ONS 15454 SDH Security Levels—Node View	9-2
Table 9-2	ONS 15454 SDH Security Levels—Network View	9-4
Table 9-3	ONS 15454 SDH Default User Idle Times	9-5
Table 9-4	Audit Trail Window Columns	9-6
Table 9-5	SDH SSM Message Set	9-8
Table 10-1	ONS 15454 SDH Circuit Status	10-4
Table 10-2	Circuit Protection Types	10-7
Table 10-3	Port State Color Indicators	10-8
Table 10-4	DCC Tunnels	10-10
Table 10-5	ONS 15454 SDH Cards Capable of Path Trace	10-15
Table 10-6	ONS 15454 SDH Cards Capable of J2 Path Trace	10-15
Table 10-7	STM Path Signal Label Assignments for Signals	10-16
Table 10-8	Bidirectional VC/TUG/Regular Multicard EtherSwitch/Point-to-Point (Straight) Ethernet Circuits	10-20
Table 10-9	Unidirectional Circuit	10-21
Table 10-10	Multicard Group Ethernet Shared Packet Ring Circuit	10-21

Table 10-11	Bidirectional Low-Order Tunnels	10-21
Table 10-12	ONS 15454 SDH Card VCAT Circuit Rates and Members	10-24
Table 10-13	ONS 15454 SDH VCAT Card Capabilities	10-24
Table 11-1	ONS 15454 SDH Rings with Redundant TCC2/TCC2P Cards	11-1
Table 11-2	Two-Fiber MS-SPRing Capacity	11-8
Table 11-3	Four-Fiber MS-SPRing Capacity	11-9
Table 12-1	General ONS 15454 SDH IP Troubleshooting Checklist	12-2
Table 12-2	ONS 15454 SDH Gateway and Element NE Settings	12-14
Table 12-3	Proxy Server Firewall Filtering Rules	12-16
Table 12-4	Proxy Server Firewall Filtering Rules When Packet Addressed to ONS 15454 SDH	12-17
Table 12-5	Cisco ONS 15454 SDH Client/Trunk Card Combinations for Provisionable Patchcords	12-22
Table 12-6	Cisco ONS 15454 SDH Client/Client Card Combinations for Provisionable Patchcords	12-22
Table 12-7	Cisco ONS 15454 SDH Trunk/Trunk Card Combinations for Provisionable Patchcords	12-23
Table 12-8	Sample Routing Table Entries	12-24
Table 12-9	Ports Used by the TCC2/TCC2P	12-25
Table 13-1	Alarms Column Descriptions	13-3
Table 13-2	Color Codes for Alarm and Condition Severities	13-4
Table 13-3	Release 4.0 and Later Port-Based Alarm Numbering Scheme	13-4
Table 13-4	Alarm Display	13-5
Table 13-5	Conditions Display	13-7
Table 13-6	Conditions Column Description	13-8
Table 13-7	History Column Description	13-9
Table 13-8	Alarm Profile Buttons	13-12
Table 13-9	Alarm Profile Editing Options	13-12
Table 14-1	Priority Queuing	14-15
Table 14-2	Spanning Tree Parameters	14-18
Table 14-3	Spanning Tree Configuration	14-18
Table 14-4	Ethernet Threshold Variables (MIBs)	14-24
Table A-1	SFP Specifications	A-4
Table A-2	Individual Card Power Requirements	A-5
Table A-3	Card Temperature Ranges and Product Names	A-6
Table B-1	ONS 15454 SDH Service State Primary States and Primary State Qualifiers	B-1
Table B-2	ONS 15454 SDH Secondary States	B-1
Table B-3	ONS 15454 SDH Administrative States	B-2
Table B-4	ONS 15454 SDH Card Service State Transitions	B-3

<i>Table B-5</i>	ONS 15454 SDH Port and Cross-Connect Service State Transitions	<b>B-5</b>
<i>Table C-1</i>	E1 Card Default Settings	<b>C-3</b>
<i>Table C-2</i>	E1-42 Card Default Settings	<b>C-4</b>
<i>Table C-3</i>	E3 Card Default Settings	<b>C-6</b>
<i>Table C-4</i>	FC-MR Card Default Settings	<b>C-8</b>
<i>Table C-5</i>	DS3I Card Default Settings	<b>C-8</b>
<i>Table C-6</i>	Data Card Default Settings	<b>C-11</b>
<i>Table C-7</i>	STM1 Card Default Settings	<b>C-11</b>
<i>Table C-8</i>	STM1-8 Card Default Settings	<b>C-13</b>
<i>Table C-9</i>	STM1E-12 Card Default Settings	<b>C-16</b>
<i>Table C-10</i>	STM4 Card Default Settings	<b>C-18</b>
<i>Table C-11</i>	STM4-4 Card Default Settings	<b>C-20</b>
<i>Table C-12</i>	STM16 Card Default Settings	<b>C-22</b>
<i>Table C-13</i>	STM64 Card Default Settings	<b>C-25</b>
<i>Table C-14</i>	MXP-2.5G-10G Card Default Settings	<b>C-27</b>
<i>Table C-15</i>	MXP-2.5G-10E Card Default Settings	<b>C-32</b>
<i>Table C-16</i>	MXP-MR-2.5G Card Default Settings	<b>C-35</b>
<i>Table C-17</i>	MXPP-MR-2.5G Card Default Settings	<b>C-38</b>
<i>Table C-18</i>	TXP_MR_10E Card Default Settings	<b>C-41</b>
<i>Table C-19</i>	TXP_MR_10G Card Default Settings	<b>C-45</b>
<i>Table C-20</i>	TXP_MR_2.5G Card Default Settings	<b>C-50</b>
<i>Table C-21</i>	TXPP_MR_10G Card Default Settings	<b>C-56</b>
<i>Table C-22</i>	OSCM Card Default Settings	<b>C-63</b>
<i>Table C-23</i>	OSC-CSM Card Default Settings	<b>C-64</b>
<i>Table C-24</i>	Node Default Settings	<b>C-65</b>
<i>Table C-25</i>	CTC Default Settings	<b>C-69</b>





## About this Guide

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### Note

The terms “Unidirectional Path Switched Ring” and “UPSR” may appear in Cisco literature. These terms do not refer to using Cisco ONS 15xxx products in a unidirectional path switched ring configuration. Rather, these terms, as well as “Path Protected Mesh Network” and “PPMN,” refer generally to Cisco’s path protection feature, which may be used in any topological network configuration. Cisco does not recommend using its path protection feature in any particular topological network configuration.

This section explains the objectives, intended audience, and organization of this publication and describes the conventions that convey instructions and other information.

## Revision History

Date	Notes
March 2007	Revision History Table added for the first time
October 2007	Updated the About this Guide chapter
April 2008	Added a Note in the “User Password, Login, and Access Policies” section of the Security chapter.
April 2009	Updated the Cisco ONS 15454 SDH bandwidth specifications section in “A.1.1 Bandwidth” of Appendix A, Hardware Specifications.

This section provides the following information:

- [Document Objectives](#)
- [Audience](#)
- [Document Organization](#)
- [Related Documentation](#)
- [Document Conventions](#)
- [Obtaining Optical Networking Information](#)
- [Obtaining Documentation and Submitting a Service Request](#)

# Document Objectives

This manual provides reference information for the Cisco ONS 15454 SDH.

## Audience

To use this publication, you should be familiar with Cisco or equivalent optical transmission hardware and cabling, telecommunications hardware and cabling, electronic circuitry and wiring practices, and preferably have experience as a telecommunications technician.

## Document Organization

Table 1 lists the chapter titles and provides a summary for each chapter.

**Table 1** Cisco ONS 15454 SDH Reference Manual Chapters

Title	Summary
Chapter 1, “Shelf and FMEC Hardware”	Includes descriptions of the rack, ferrites, power and ground, fan-tray assembly, air filter, card slots, cable, cable connectors, and cable routing.
Chapter 2, “Common Control Cards”	Includes descriptions of the TCC2P, XC10G, XC-VXL, and AIC-I cards.
Chapter 3, “Electrical Cards”	Includes descriptions of E1-N-14, E1-42, E3-12, DS3i-N-12, STM1E-12, FMEC cards, MIC cards, card temperature ranges, and compatibility.
Chapter 4, “Optical Cards”	Includes descriptions of the STM1-4, STM1-8, STM-4, STM4-4, STM-16, STM-64, TXP_MR, TXPP_MR, and MXP cards, as well as card temperature ranges and card compatibility.
Chapter 5, “Ethernet Cards”	Includes descriptions of the E100T-G, E1000-2-G, G1000-4, G1K-4, ML100T-12, and ML1000-2 cards and gigabit interface converters.
Chapter 6, “Storage Access Networking Cards”	Includes the FC_MR-4 card description and application.
Chapter 7, “Card Protection”	Includes electrical, optical, and transponder and muxponder card protection methods, as well as external switching commands.
Chapter 8, “Cisco Transport Controller Operation”	Includes information about CTC delivery, installation, computer requirements, connection, the CTC window, and database reset and revert.
Chapter 9, “Security and Timing”	Includes user set up and security, and node/network timing.

**Table 1** Cisco ONS 15454 SDH Reference Manual Chapters (continued)

Title	Summary
Chapter 10, “Circuits and Tunnels”	Includes descriptions of circuit properties, cross-connect card bandwidth usage, data communications channel (DCC) and IP-encapsulated tunnels, multiple destination circuits, circuit monitoring, subnetwork connection protection (SNCP) and multiplex section-shared protection rings (MS-SPRing) circuits, J1 path trace, path signal labels, manual and automatic circuit routing, and virtual concatenated (VCAT) circuits.
Chapter 11, “SDH Topologies and Upgrades”	Includes the SDH configurations used by the ONS 15454 SDH; including MS-SPRings, SNCPs, subtending rings, linear ADMs, and optical bus configurations, as well as information about upgrading optical speeds within any configuration.
Chapter 12, “CTC Network Connectivity”	Includes IP addressing scenarios and information about IP networking with the ONS 15454 SDH.
Chapter 13, “Alarm Monitoring and Management”	Explains alarm, condition, and history display; severities; profiles; suppression; external alarms; and the audit trail.
Appendix A, “Hardware Specifications”	Provides specifications for the ONS 15454 SDH shelf assembly and cards.
Appendix B, “Administrative and Service States”	Describes the extended state model for cards, ports, and cross-connects.

## Related Documentation

Use the *Cisco ONS 15454 SDH Reference Manual* with the following referenced publications:

- *Cisco ONS 15454 SDH Procedure Guide*—Provides procedures to install, turn up, provision, and maintain a Cisco ONS 15454 SDH node and network.
- *Cisco ONS 15454 SDH Troubleshooting Guide*—Provides general troubleshooting procedures, alarm descriptions and troubleshooting procedures, and hardware replacement instructions.
- *Cisco ONS 15454 SDH TL1 Command Guide*—Provides test access TL1 commands, configurations, and parameter types.
- *Release Notes for the Cisco ONS 15454 SDH Release 5.0*—Provides caveats, closed issues, and new feature and functionality information.

For an update on End-of-Life and End-of-Sale notices, refer to

[http://cisco.com/en/US/products/hw/optical/ps2006/prod\\_eol\\_notices\\_list.html](http://cisco.com/en/US/products/hw/optical/ps2006/prod_eol_notices_list.html).

## Document Conventions

This publication uses the following conventions:

<b>Convention</b>	<b>Application</b>
<b>boldface</b>	Commands and keywords in body text.
<i>italic</i>	Command input that is supplied by the user.
[ ]	Keywords or arguments that appear within square brackets are optional.
{ x   x   x }	A choice of keywords (represented by x) appears in braces separated by vertical bars. The user must select one.
Ctrl	The control key. For example, where Ctrl + D is written, hold down the Control key while pressing the D key.
screen font	Examples of information displayed on the screen.
<b>boldface screen font</b>	Examples of information that the user must enter.
< >	Command parameters that must be replaced by module-specific codes.

**Note**


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Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the document.

---

**Caution**


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Means *reader be careful*. In this situation, the user might do something that could result in equipment damage or loss of data.

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Warning

**IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

**SAVE THESE INSTRUCTIONS**

Waarschuwing

**BELANGRIJKE VEILIGHEIDSINSTRUCTIES**

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

**BEWAAR DEZE INSTRUCTIES**

Varoitus

**TÄRKEITÄ TURVALLISUUSOHJEITA**

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelyyn liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

**SÄILYTÄ NÄMÄ OHJEET**

Attention

**IMPORTANTES INFORMATIONS DE SÉCURITÉ**

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

**CONSERVEZ CES INFORMATIONS**

Warnung

**WICHTIGE SICHERHEITSHINWEISE**

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

**BEWAHREN SIE DIESE HINWEISE GUT AUF.**

**Avvertenza    IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

**CONSERVARE QUESTE ISTRUZIONI****Advarsel    VIKTIGE SIKKERHETSINSTRUKSJONER**

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

**TA VARE PÅ DISSE INSTRUKSJONENE****Aviso    INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

**GUARDE ESTAS INSTRUÇÕES****¡Advertencia!    INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

**GUARDE ESTAS INSTRUCCIONES****Varning!    VIKTIGA SÄKERHETSANVISNINGAR**

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

**SPARA DESSA ANVISNINGAR**

## FONTOS BIZTONSÁGI ELOÍRÁSOK

**Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.**

## ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

### Предупреждение

### ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

### СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ

### 警告

### 重要的安全性说明

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

### 警告

### 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

### 주의

### 중요 안전 지침

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

**Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.

**GUARDE ESTAS INSTRUÇÕES****Advarsel VIGTIGE SIKKERHEDSANVISNINGER**

Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemeskade. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.

**GEM DISSE ANVISNINGER****تحذير****إرشادات الأمان الهامة**

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمة الكهربائية وكن على علم بالإجراءات القياسية للحيولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في آخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز. قم بحفظ هذه الإرشادات

**Upozorenje VAŽNE SIGURNOSNE NAPOMENE**

Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.

**SAČUVAJTE OVE UPUTE****Upozornění DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY**

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

**USCHOVEJTE TYTO POKYNY**

Προειδοποίηση	<p><b>ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ</b></p> <p>Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθειες πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.</p> <p><b>ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ</b></p>
אזהרה	<p style="text-align: right;"><b>הוראות בטיחות חשובות</b></p> <p>סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.</p> <p style="text-align: right;"><b>שמור הוראות אלה</b></p>
Opomena	<p><b>ВАЖНИ БЕЗБЕДНОСНИ НАПАТСТВИЈА</b></p> <p>Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.</p> <p><b>ЧУВАЈТЕ ГИ ОБИЕ НАПАТСТВИЈА</b></p>
Ostrzeżenie	<p><b>WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA</b></p> <p>Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.</p> <p><b>NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ</b></p>
Upozornenie	<p><b>DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY</b></p> <p>Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.</p> <p><b>USCHOVAJTE SI TENTO NÁVOD</b></p>

## Obtaining Optical Networking Information

This section contains information that is specific to optical networking products. For information that pertains to all of Cisco, refer to the [Obtaining Documentation and Submitting a Service Request](#) section.

## Where to Find Safety and Warning Information

For safety and warning information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document that accompanied the product. This publication describes the international agency compliance and safety information for the Cisco ONS 15454 system. It also includes translations of the safety warnings that appear in the ONS 15454 system documentation.

## Cisco Optical Networking Product Documentation CD-ROM

Optical networking-related documentation, including Cisco ONS 15xxx product documentation, is available in a CD-ROM package that ships with your product. The Optical Networking Product Documentation CD-ROM is updated periodically and may be more current than printed documentation.

## Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.



# Shelf and FMEC Hardware

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This chapter provides a description of Cisco ONS 15454 SDH shelf and backplane hardware. Card and cable descriptions are provided in [Chapter 2, “Common Control Cards,”](#) [Chapter 3, “Electrical Cards,”](#) [Chapter 4, “Optical Cards,”](#) and [Chapter 14, “Ethernet Operation.”](#) To install equipment, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [1.1 Overview, page 1-1](#)
- [1.2 Front Door, page 1-3](#)
- [1.3 Front Mount Electrical Connection, page 1-7](#)
- [1.4 E1-75/120 Conversion Panel, page 1-9](#)
- [1.5 Coaxial Cable, page 1-10](#)
- [1.6 Twisted-Pair Balanced Cable, page 1-10](#)
- [1.7 Cable Routing and Management, page 1-11](#)
- [1.9 Fan-Tray Assembly, page 1-13](#)
- [1.10 Power and Ground Description, page 1-14](#)
- [1.11 Alarm, Timing, LAN, and Craft Pin Connections, page 1-14](#)
- [1.12 Cards and Slots, page 1-15](#)
- [1.13 Software and Hardware Compatibility, page 1-18](#)



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**Note**

The Cisco ONS 15454 SDH assembly is intended for use with telecommunications equipment only.

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**Caution**

Unused card slots should be filled with a blank faceplate (Cisco P/N 15454E-BLANK). The blank faceplate ensures proper airflow when operating the ONS 15454 SDH without the front door attached, although Cisco recommends that the front door remain attached.

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## 1.1 Overview

When installed in an equipment rack, the ONS 15454 SDH assembly is typically connected to a fuse and alarm panel to provide centralized alarm connection points and distributed power for the ONS 15454 SDH. Fuse and alarm panels are third-party equipment and are not described in this

documentation. If you are unsure about the requirements or specifications for a fuse and alarm panel, consult the user documentation for the related equipment. The front door of the ONS 15454 SDH allows access to the shelf assembly, fan-tray assembly, and cable-management area. The FMEC cover at the top of the shelf allows access to power connectors, external alarms and controls, timing input and output, and craft interface terminals.

You can mount the ONS 15454 SDH in an ETSI rack. The shelf assembly weighs approximately 26 kg (57 pounds) with no cards installed. The shelf assembly includes a front door and a Front Mount Electrical Connection (FMEC) cover for added security, a fan tray module for cooling, and extensive cable-management space.

All ONS 15454 SDH optical cards have SC connectors on the card faceplate, except the STM-1SH 1310-8 card, which has LC connectors. Fiber-optic cables are routed into the front of the optical and Ethernet cards. Electrical cards (E-1, E-3, DS3i, STM-1E) require FMEC cards to provide the cable connection points for the shelf assembly.

The ONS 15454 SDH is powered using –48VDC power. Negative, return, and ground power terminals are connected via the MIC-A/P and the MIC-C/T/P cards.

**Note**

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In this chapter, the terms “ONS 15454 SDH” and “shelf assembly” are used interchangeably. In the installation context, these terms have the same meaning. Otherwise, shelf assembly refers to the physical steel enclosure that holds cards and connects power, and ONS 15454 SDH refers to the entire system, both hardware and software.

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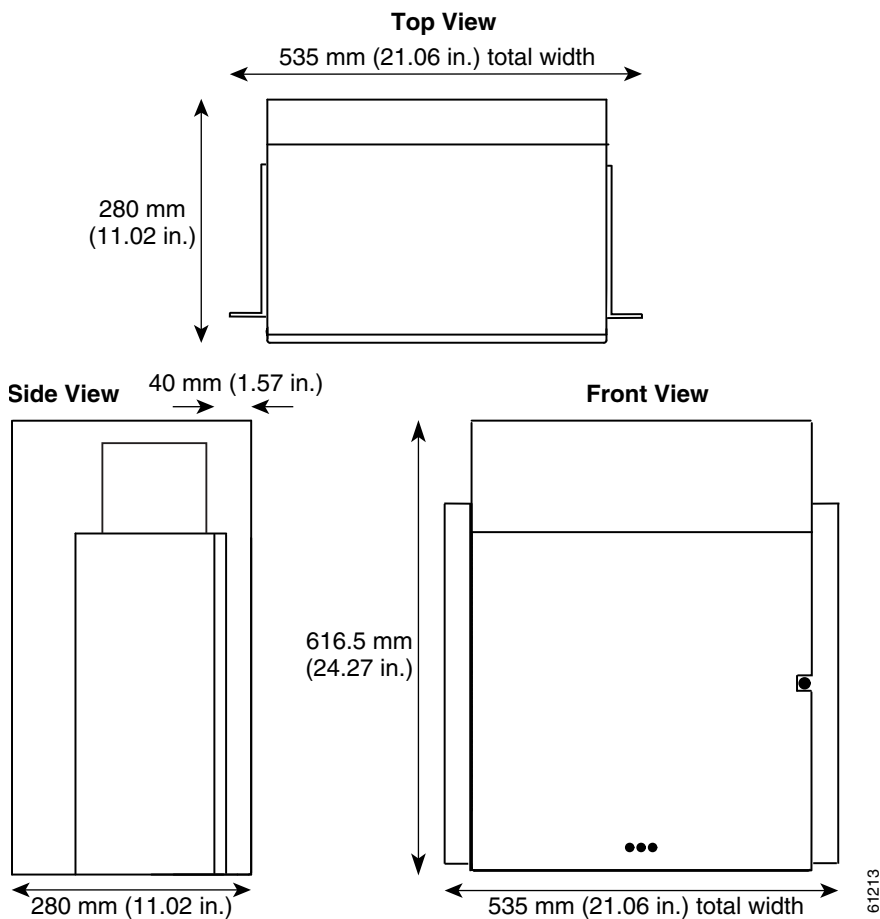
Install the ONS 15454 SDH in compliance with your local and national electrical codes:

- United States: National Fire Protection Association (NFPA) 70; United States National Electrical Code
- Canada: Canadian Electrical Code, Part I, CSA C22.1
- Other countries: If local and national electrical codes, are not available, refer to IEC 364, Part 1 through Part 7.



Figure 1-1 provides the dimensions of the ONS 15454 SDH.

**Figure 1-1 ONS 15454 SDH Dimensions**

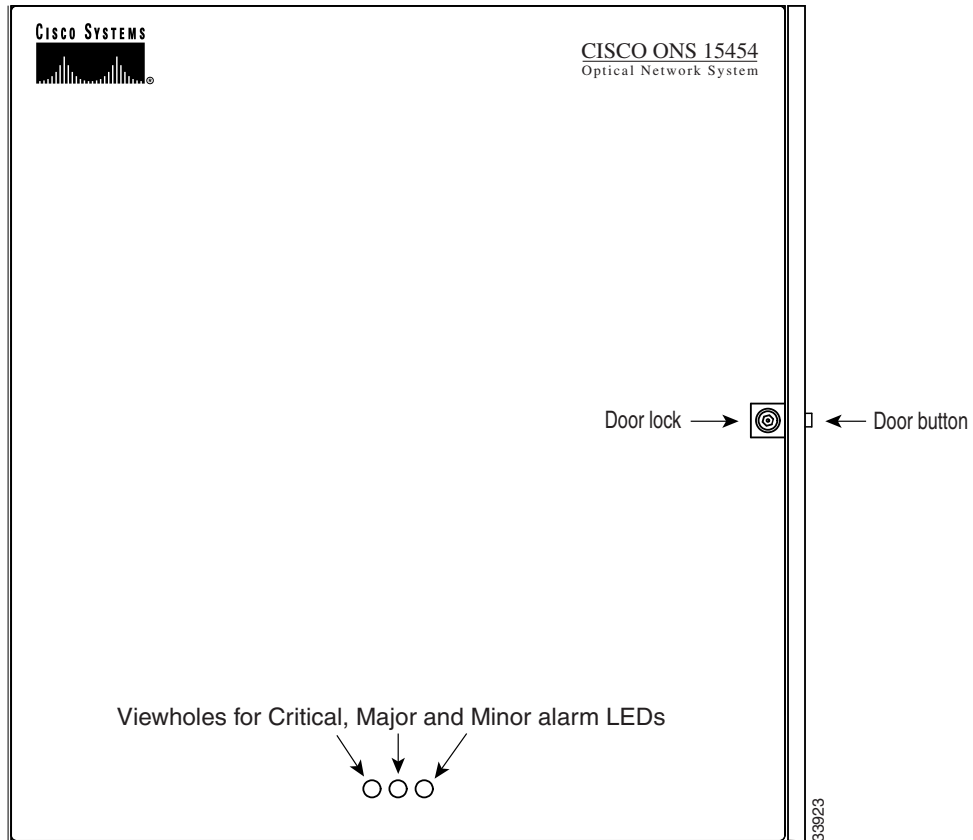


## 1.2 Front Door

The Critical, Major, and Minor alarm LEDs visible through the front door indicate whether a critical, major, or minor alarm is present anywhere on the ONS 15454 SDH. These LEDs must be visible so technicians can quickly determine if any alarms are present. You can use the LCD to further isolate alarms.

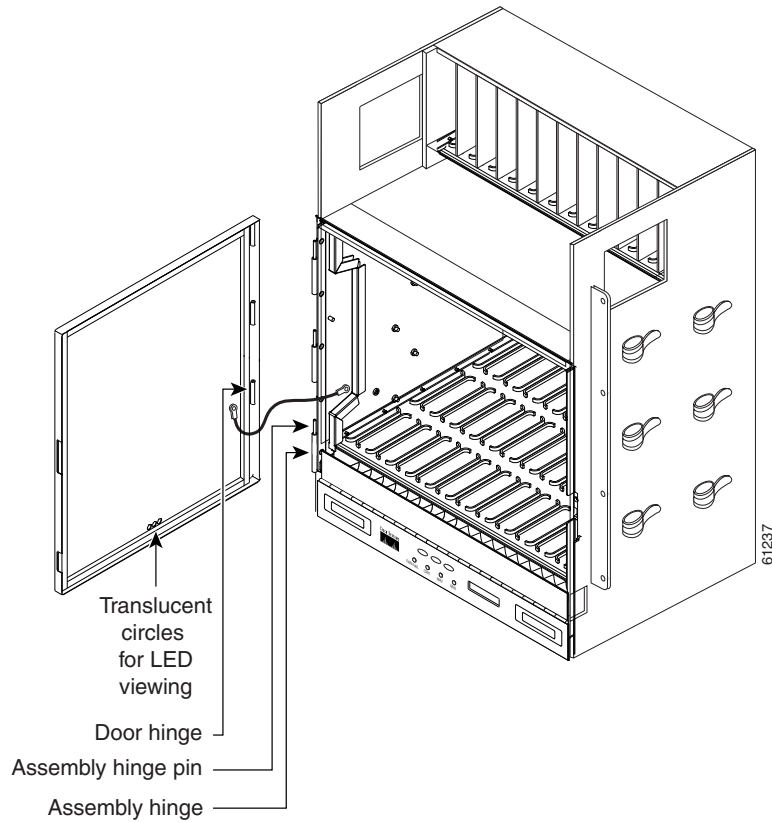
The ONS 15454 SDH features a locked door to the front compartment. A pinned hex key that unlocks the front door ships with the ONS 15454 SDH. A button on the right side of the shelf assembly releases the door. The front door provides access to the shelf assembly, cable-management tray, fan-tray assembly, and LCD screen (Figure 1-2).

**Figure 1-2** The ONS 15454 SDH Front Door



You can remove the front door of the ONS 15454 SDH to provide unrestricted access to the front of the shelf assembly (Figure 1-3).

**Figure 1-3** Removing the ONS 15454 SDH Front Door



An erasable label is pasted on the inside of the front door (Figure 1-4). You can use the label to record slot assignments, port assignments, card types, node ID, rack ID, and serial number for the ONS 15454 SDH.

Figure 1-4 Front-Door Erasable Label

SHELF ID:		RACK ID:					SERIAL #:			IP ADDRESS:				MAC ADDRESS:			
SLOT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CARD NAME							TCC		---		TCC						
1																	
2																	
3																	
4																	
5																	
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42																	

PORT ASSIGNMENTS

**⚠ DANGER**  
**GEFAHR**  
**PELIGRO**  
**DANGER**  
**危險**

INVISIBLE LASER RADIATION MAY BE EMITTED FROM THE OPTICAL CARDS AT THE END OF UNTERMINATED FIBER CABLES OR CONNECTORS. DO NOT STARE INTO THE BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS. THIS EQUIPMENT IS A CLASS I (CDRH)/CLASS 1M (IEC) LASER PRODUCT. THIS PRODUCT COMPLIES WITH THE RADIATION PERFORMANCE STANDARDS OF 21 CFR 1040.10 AND 1040.11, IEC 60825-1 AND IEC 60825-2.

DIE OPTISCHEN KARTEN KÖNNEN MÖGLICHERWEISE AM ENDE NICHT ANGESCHLOSSENER FASERKABEL ODER -STECKVERBINDER UNSICHTBARE LASERSTRAHLEN EMITTIEREN. NICHT IN DEN STRAHL BLICKEN, AUCH NICHT DIREKT MIT OPTISCHEN INSTRUMENTEN. DIESE AUSRÜSTUNG IST EIN LASERPRODUKT DER KLASSE I (CDRH)/KLASSE 1M (IEC). DIESES PRODUKT ERFÜLLT DIE STANDARDS FÜR STRAHLUNGSLEISTUNG 21 CFR 1040.10 UND 1040.11, IEC 60825-1 UND IEC 60825-2.

PODRÍA EMITIRSE RADIACIÓN LÁSER INVISIBLE DE LAS TARJETAS ÓPTICAS EN EL EXTREMO DE LOS CABLES O CONECTORES DE FIBRA ÓPTICA NO TERMINADOS. NO MIRAR DIRECTAMENTE AL HAZ NI VER DIRECTAMENTE CON INSTRUMENTOS ÓPTICOS. ESTE EQUIPO ES UN PRODUCTO DE LÁSER DE CLASE I (CDRH)/CLASE 1M (IEC) ESTE PRODUCTO, CUMPLE CON LOS ESTÁNDARES DE DESEMPEÑO DE RADIACIÓN DE 21 CFR 1040.10 Y 1040.11, CEI 60825-1 Y CEI 60825-2.

ÉMISSION POSSIBLE DE RAYONS LASER À PARTIR DES CARTES OPTIQUES SE TROUVANT À L'EXTRÊME DES CONNECTEURS OU DES CÂBLES OPTIQUES NON ABOUTIS. NE PAS REGARDER LE FAISCEAU DIRECTEMENT NI L'EXAMINER À L'AIDE D'INSTRUMENTS OPTIQUES. CET APPAREIL EST UN PRODUIT LASER DE CLASSE I (CDRH)/CLASSE 1M (IEC) CE PRODUIT EST CONFORME AUX NORMES DE PERFORMANCE DE RAYONNEMENT DE 21 CFR 1040.10 ET 1040.11, IEC 60825-1 ET IEC 60825-2.

未收絕的光纖電纜或接頭末端的雷射卡可能會放射肉眼看不見的雷射線。請勿直接目視雷射或以光學儀器直接查看。  
 本設備符合CLASS I (CDRH) / 第1M類(IEC)雷射製品。  
 本產品符合雷射性能標準(RADIATION PERFORMANCE STANDARDS)或21CFR1040.10以及1040.11、IEC60825-1和IEC60825-2之規定。

**⚠ CAUTION**

THIS UNIT MAY HAVE MORE THAN ONE POWER CONNECTION. REMOVE ALL CONNECTIONS TO DEENERGIZE THE SYSTEM BEFORE SERVICING TO AVOID ELECTRIC SHOCK.

NO OPERATOR SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL.

TO MAINTAIN EMI COMPLIANCE, REPLACE FRONT COVER AFTER SERVICING.

**⚠ ELECTROSTATIC SENSITIVE DEVICES.**

**VORSICHT**

DIESER EINHEIT HAT MÖGLICHERWEISE MEHR ALS EINEN STROMANSCHLUSS. VOR DER WARTUNG ALLE ANSCHLÜSSE ABTRENKEN, UM DAS SYSTEM VOM NETZ ZU TRENNEN. UM ELEKTROSCHOCKSCHADEN ZU VERMEIDEN.

ALLE BENUTZERN KÖNNEN NICHT VOM BENUTZER GEWARTET WERDEN. WARTUNGSARBEITEN SIND VORQUALIFIZIERTEN PERSONAL DURCHFÜHREN.

UM EMPFORSCHÜTTEN ZU ERFÜLLEN, NACH DER WARTUNG VORDERE ABDECKUNG ERNEUT ABMONTIEREN.

ELEKTROSTATISCH EMPFINDLICHES GERÄT.

**PRECAUCIÓN**

ES POSIBLE QUE ESTA UNIDAD TENGA VARIOS DE UNA CONEXIÓN ELÉCTRICA. PARA EVITAR CHOQUE ELÉCTRICO, DESCONECTE TODAS LAS CONEXIONES ELÉCTRICAS DEL SISTEMA ANTES DE HACER REPARACIONES.

ESTA UNIDAD NO DEBE SER REPARADA POR PERSONAL NO CALIFICADO. LAS REPARACIONES DEBEN SER REALIZADAS POR PERSONAL CALIFICADO.

PARA CUMPLIR CON LAS REGLAS DE INTERFERENCIA ELECTROMAGNÉTICA, REEMPLAZA LA CUBIERTA DELANTERA DESPUÉS DE HACER REPARACIONES.

DISPOSITIVOS SENSIBLES A LA ENERGÍA ELECTROSTÁTICA.

**ATTENTION**

CETTE UNITÉ PEUT DISPOSER DE PLUSIEURS RACCORDEMENTS À UNE SOURCE D'ALIMENTATION. DÉBRANCHER LES CONNEXIONS POUR DÉSENSIBILISER LE SYSTÈME ET ÉVITER TOUT RISQUE D'ÉLECTROCUTION.

L'OPÉRATEUR NE DOIT PAS DÉTACHER LES PIÈCES INTÉRIEURES. COMPLÉTER L'ENTRÉE DE CES PIÈCES À UN PERSONNEL QUALIFIÉ.

REMPLEZ LE COUVERCLE AVANT APRÈS AVOIR RÉALISÉ L'ENTRÈTE. CONFORMER-SE AUX NORMES CEM.

APPAREILS SENSIBLES À L'ÉLECTRICITÉ STATIQUE.

**注意**

本裝置可能有一個以上之電源連接。請在維修前完全脫離所有電源。由合格專業師的電源。以免發生電擊的危險。

內部零件須由合格專業技師進行維修。操作員不得自行進行維修。

為了保持符合EMC之規定。請在維修後將前蓋蓋好。本裝置有靜電敏感。

PIN 47-12460-01

The front door label also includes the Class I and Class 1M laser warning (Figure 1-5).

Figure 1-5 Laser Warning on the Front-Door Label



## 1.3 Front Mount Electrical Connection

The positive and negative power terminals are located on FMEC cards in the Electrical Facility Connection Assembly (EFCA). The ground connection is the grounding receptacle on the side panel of the shelf.

The ONS 15454 SDH EFCA at the top of the shelf has 12 FMEC slots numbered sequentially from left to right (18 to 29). Slots 18 to 22 and 25 to 29 provide electrical connections. Slots 23 and 24 host the MIC-A/P and MIC-C/T/P cards, respectively.

FMEC-E1, FMEC-DS1/E1, FMEC E1-120NP, and FMEC E1-120PROA cards can be installed in Slots 18 to 21; the FMEC E1-120PROB card can be installed in Slots 26 to 29; and FMEC-E3/DS3, and FMEC STM1E 1:1 cards can be installed in Slots 18 to 21 or Slots 26 to 29. FMEC electrical card assignment is as follows:

- FMEC Slot 18 supports an electrical card in Slot 1.
- FMEC Slot 19 supports an electrical card in Slot 2.

- FMEC Slot 20 supports an electrical card in Slot 3.
- FMEC Slot 21 supports an electrical card in Slot 4.
- FMEC Slot 22 supports an electrical card in Slot 5.
- FMEC Slot 23 hosts the MIC-A/P alarm and power FMEC.
- FMEC Slot 24 supports the MIC-C/T/P timing, craft, and power FMEC.
- FMEC Slot 25 supports an electrical card in Slot 13.
- FMEC Slot 26 supports an electrical card in Slot 14.
- FMEC Slot 27 supports an electrical card in Slot 15.
- FMEC Slot 28 supports an electrical card in Slot 16.
- FMEC Slot 29 supports an electrical card in Slot 17.

FMEC slots have symbols indicating the type of cards that you can install in the slots. Each ONS 15454 SDH FMEC has a corresponding symbol. The symbol on the FMEC must match the symbol on the slot. [Table 1-1](#) shows the slot-FMEC symbol definitions.

**Table 1-1 Slot and FMEC Symbols**

Color/Shape	Definition
Orange/Circle	Electrical 75-ohm E-1 connection via 1.0/2.3 miniature coax connectors. Only install ONS 15454 SDH FMECs with a circle symbol on the faceplate.
	Electrical 120-ohm E-1 connection via DB-37 connectors. Only install ONS 15454 SDH FMECs with a circle symbol on the faceplate.
	Electrical 75-ohm E3/DS3 connection via 1.0/2.3 miniature coax connectors. Only install ONS 15454 SDH FMECs with a circle symbol on the faceplate.
Green/Star	Electrical 75-ohm E1-42 and STM-1e connections via 1.0/2.3 miniature coax connectors. Only install ONS 15454 SDH FMECs with a star symbol on the faceplate.
Red/Vertical ellipse	Node power and interface for environmental alarms. Only install ONS 15454 SDH FMECs with a vertical ellipse symbol on the faceplate.
Red/Horizontal ellipse	Node power and LAN timing. Only install ONS 15454 SDH FMECs with a horizontal ellipse symbol on the faceplate.

[Table 1-2](#) lists the number of ports, line rates, connector options, and connector locations for ONS 15454 SDH electrical FMECs.

**Table 1-2 FMEC, Ports, Line Rates, and Connectors**

FMEC	Ports	Line Rate per Port	Connector Type	Connector Location
FMEC-E1	14	2.048 Mbps	1.0/2.3 miniature coax connector	EFCA
FMEC-DS1/E1	14	2.048 Mbps	DB-37	EFCA
FMEC E1-120NP	42	2.048 Mbps	Molex 96-pin LFH connector	EFCA
FMEC E1-120PROA	3 to 42	2.048 Mbps	Molex 96-pin LFH connector	EFCA, Slots 18 to 21

**Table 1-2 FMEC, Ports, Line Rates, and Connectors (continued)**

FMEC	Ports	Line Rate per Port	Connector Type	Connector Location
FMEC E1-120PROB	3 to 42	2.048 Mbps	Molex 96-pin LFH connector	EFCA, Slots 26 to 29
FMEC-E3/DS3	12	34.368 Mbps 44.736 Mbps	1.0/2.3 miniature coax connector	EFCA
FMEC STM1E 1:1	12 (protected) or 24 (nonprotected)	155.52 Mbps	1.0/2.3 miniature coax connector	EFCA

**Note**

The E1-120NP FMEC can only be used in Slots 18–21 and Slots 26–29. The STM1E 1:1 FMEC can only be used in Slots 18 and 19, 20 and 21, 26 and 27, or 28 and 29.

## 1.4 E1-75/120 Conversion Panel

You need an E1-75/120 conversion panel if you want to convert the balanced 120-ohm interfaces of the E1-42 card and the corresponding FMECs to unbalanced 75-ohm interfaces.

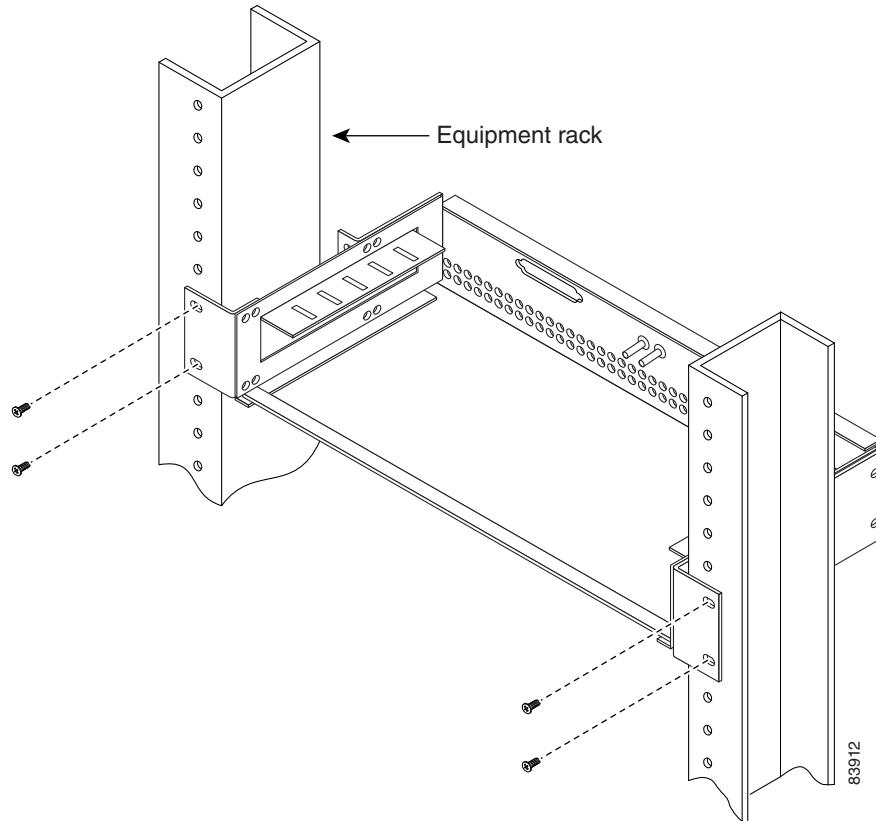
The E1-75/120 contains eighty-four 1.0/2.3 miniature coax connectors (42 for transmit, 42 for receive) to the customer side and two Molex 96-pin LFH connectors to the E1-42 FMEC 120-ohm side. Each of the Molex 96-pin LFH connectors connects 21 inputs and 21 outputs. The E1-75/120 conversion panel is intended to be used in digital distribution frames (DDFs), ETSI racks, and ANSI racks.

You can install the E1-75/120 conversion panel in the rack of your ONS 15454 SDH or in a nearby rack. If you install the E1-75/120 conversion panel in a place where a longer cable is required, make sure that the total cable loss of the balanced 120-ohm cable and the unbalanced 75-ohm cable does not exceed the maximum allowed value. Refer to the *Cisco ONS 15454 SDH Reference Manual* for details. To ensure that the E1-75/120 conversion panel is secure, use one or two M6 mounting screws for each side of the shelf assembly. [Figure 1-6 on page 1-10](#) shows the rack-mounting for the E1-75/120 conversion panel.

**Note**

If required, the mounting brackets of the E1-75/120 conversion panel can be uninstalled, rotated 90 degrees, and reinstalled to enable 19-inch (482.6 mm) rack mounting.

**Figure 1-6** Mounting the E1-75/120 Conversion Panel in a Rack



## 1.5 Coaxial Cable



**Caution**

Always use the supplied ESD wristband when working with a powered ONS 15454 SDH. Plug the wristband cable into the ESD jack located on the lower-right outside edge of the shelf assembly.

All interfaces that are listed in [Table 1-2 on page 1-8](#) with 1.0/2.3 miniature coax connectors (E-1, E-3, DS-3, and STM-1E) must be connected using a 75-ohm coaxial cable.

The electromagnetic compatibility (EMC) performance of the node depends on good-quality coaxial cables, such as Shuner Type G 03233 D or the equivalent.

## 1.6 Twisted-Pair Balanced Cable



**Caution**

Always use the supplied ESD wristband when working with a powered ONS 15454 SDH. Plug the wristband cable into the ESD jack located on the lower-right outside edge of the shelf assembly.



All E-1 interfaces that are listed in [Table 1-2 on page 1-8](#) with DB-37 or with Molex 96-pin LFH connectors must be connected using a 120-ohm twisted-pair balanced cable. For the interfaces that use Molex 96-pin LFH connectors Cisco offers ready-made cables.

## 1.7 Cable Routing and Management

The ONS 15454 SDH cable management facilities include the following:

- A cable-routing channel (behind the fold-down door) that runs the width of the shelf assembly, [Figure 1-7](#)
- Plastic horseshoe-shaped fiber guides at each side opening of the cable-routing channel that ensure the proper bend radius is maintained in the fibers, [Figure 1-8 on page 1-12](#)



**Note** You can remove the fiber guide if necessary to create a larger opening (if you need to route CAT-5 Ethernet cables out the side, for example). To remove the fiber guide, take out the three screws that anchor it to the side of the shelf assembly.

- A fold-down door that provides access to the cable-management tray
- Reversible jumper routing fins that enable you to route cables out either side by positioning the fins as desired

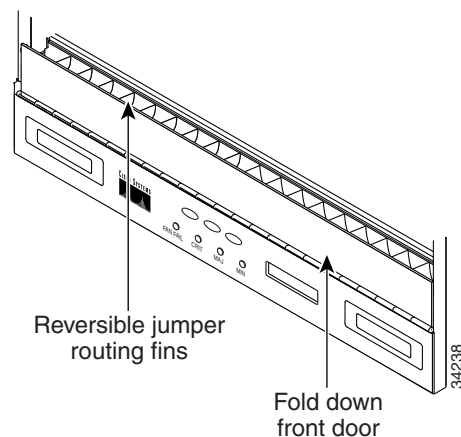


**Note** To remove the jumper slack storage reels, take out the screw in the center of each reel.

- Optional fiber management tray (recommended for DWDM nodes)

[Figure 1-7](#) shows the cable management facilities that you can access through the fold-down front door, including the cable-routing channel and the jumper routing fins.

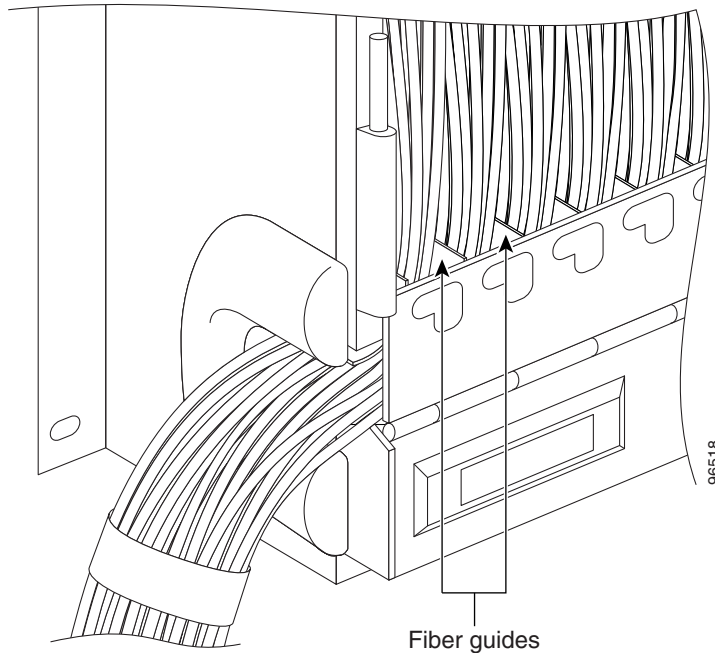
**Figure 1-7** Managing Cables on the Front Panel



## 1.8 Fiber Management

The jumper routing fins are designed to route fiber jumpers out of both sides of the shelf. Slots 1 to 6 exit to the left, and Slots 12 to 17 exit to the right. [Figure 1-8](#) shows fibers routed from cards in the left slots, down through the fins, then exiting out the fiber channel to the left. The maximum capacity of the fiber routing channel depends on the size of the fiber jumpers.

**Figure 1-8** Fiber Capacity



[Table 1-3](#) provides the maximum capacity of the fiber channel for one side of a shelf, depending on fiber size and number of Ethernet cables running through that fiber channel.

**Table 1-3** Fiber Channel Capacity (One Side of the Shelf)

Fiber Diameter	Maximum Number of Fibers Exiting Each Side		
	No Ethernet Cables	One Ethernet Cable	Two Ethernet Cables
1.6 mm (0.6 inch)	126	110	94
2 mm (0.7 inch)	80	70	60
3 mm (0.11 inch)	36	31	26

Plan your fiber size according to the number of cards/ports installed in each side of the shelf. For example, if your port combination requires 36 fibers, 3 mm (0.11 inch) fiber is adequate. If your port combination requires 68 fibers, you must use 2 mm (0.07 inch) or smaller fibers.

## 1.9 Fan-Tray Assembly

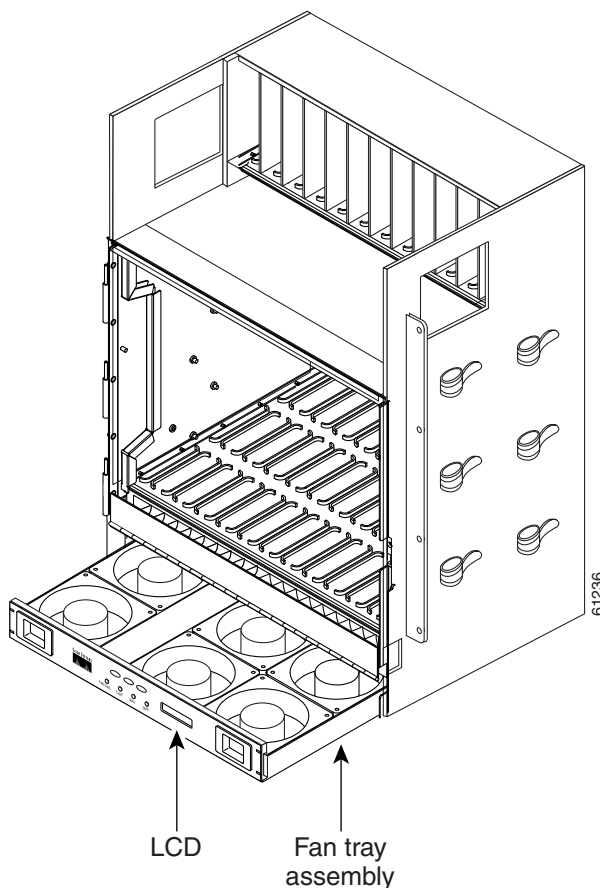
The fan-tray assembly is located at the bottom of the ONS 15454 SDH. After you install the fan-tray assembly, you only need to open the drawer if a fan fails, or if you need to replace or clean the fan-tray air filter. Do not operate an ONS 15454 SDH without a fan-tray air filter. Refer to the “Maintain the Node” chapter in the *Cisco ONS 15454 SDH Procedure Guide* for information about cleaning and maintaining the fan-tray air filter.

The fan-tray assembly is a removable drawer that holds fans and fan-control circuitry for the ONS 15454 SDH. Cisco recommends removing the front door of the chassis when removing or installing the fan-tray assembly. The front of the fan-tray assembly has an LCD screen that provides slot and port-level information for all ONS 15454 SDH card slots, including the number of critical, major, and minor alarms. For STM-N cards, you can use the LCD to determine if a port is in working or protect mode and is active or standby. It also displays whether the software load is SONET or SDH and the software version number.

The temperature measured by the TCC2/TCC2P sensors is displayed on the LCD screen.

See [Figure 1-9](#) for the position of the fan tray assembly.

**Figure 1-9** Position of the Fan-Tray Assembly



**Caution**

Do not operate an ONS 15454 SDH without a fan-tray air filter. A fan-tray air filter is mandatory.

## 1.9.1 Fan Speed

If one or more fans fail on the fan-tray assembly, replace the entire assembly. You cannot replace individual fans. The red Fan Fail LED on the front of the fan tray illuminates when one or more fans fail. For fan tray replacement instructions, refer to the *Cisco ONS 15454 SDH Troubleshooting Guide*. The red Fan Fail LED clears after you install a working fan-tray assembly.

Fan speed is controlled by TCC2/TCC2P card temperature sensors. The sensors measure the input air temperature at the fan-tray assembly. Fan speed options are low, medium, and high. If the TCC2 card fails, the fans automatically shift to high speed. The temperature measured by the TCC2 sensors is displayed on the LCD screen.

## 1.9.2 Air Filter

The ONS 15454 SDH contains a reusable air filter that is installed beneath the fan-tray assembly.

The reusable filter is made of a gray, open-cell, polyurethane foam that is specially coated to provide fire and fungi resistance. Spare filters should be kept in stock. Clean the filter every three to six months. Replace the air filter every two to three years. Avoid cleaning the air filter with harsh cleaning agents or solvents.

## 1.10 Power and Ground Description

Ground the equipment according to standards or local practices.

The ONS 15454 SDH has redundant –48 VDC power connectors on the MIC-A/P and MIC-C/T/P faceplates.

To install redundant power feeds, use the two power cables shipped with the ONS 15454 SDH and one ground cable.

For details, see the [“3.17 MIC-A/P FMEC” section on page 3-30](#) and the [“3.18 MIC-C/T/P FMEC” section on page 3-33](#).



**Caution**

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Only use the power cables shipped with the ONS 15454 SDH.

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## 1.11 Alarm, Timing, LAN, and Craft Pin Connections



**Caution**

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Always use the supplied ESD wristband when working with a powered ONS 15454 SDH. Plug the wristband cable into the ESD jack located on the lower-right outside edge of the shelf assembly.

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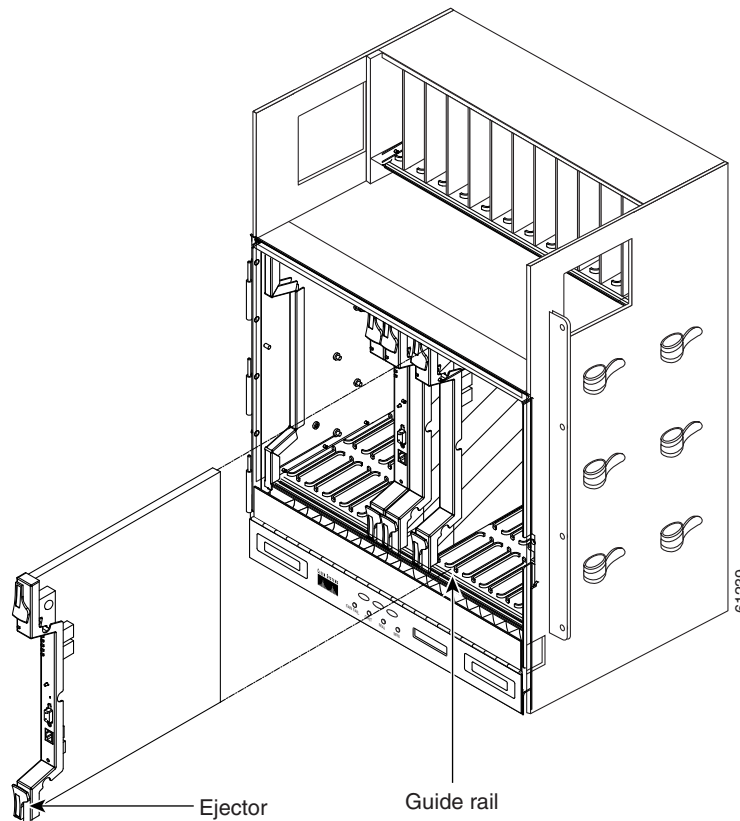
The MIC-A/P and the MIC-C/T/P FMECs in the EFCA area at the top of the ONS 15454 SDH shelf are used to connect alarm, timing, LAN, and craft connections to the ONS 15454 SDH.

For details, see the [“3.17 MIC-A/P FMEC” section on page 3-30](#) and the [“3.18 MIC-C/T/P FMEC” section on page 3-33](#).

## 1.12 Cards and Slots

ONS 15454 SDH cards have electrical plugs at the back that plug into electrical connectors on the shelf assembly backplane. When the ejectors are fully closed, the card plugs into the assembly backplane. [Figure 1-10](#) shows card installation.

**Figure 1-10** Installing Cards in the ONS 15454 SDH



### 1.12.1 Card Slot Requirements

The ONS 15454 SDH shelf assembly has 17 card slots numbered sequentially from left to right. Slots 1 through 6 and 12 through 17 are for traffic-bearing cards.

Slots 7 and 11 are dedicated to TCC2/TCC2P cards. Slots 8 and 10 are dedicated to cross-connect (XC-VXL-2.5G, XC-VXL-10G, XC10G) cards. Slot 9 is reserved for the optional AIC-I card. Slots 3 and 15 can also host protect cards that are used in 1:N protection.



#### Caution

Do not operate the ONS 15454 SDH with a single TCC2/TCC2P card or a single XC-VXL-2.5G/XC-VXL-10G/XC10G card installed. Always operate the shelf assembly with one working and one protect card of the same type.

Shelf assembly slots have symbols indicating the type of cards that you can install in them. Each ONS 15454 SDH card has a corresponding symbol. The symbol on the card must match the symbol on the slot.

Table 1-4 shows the slot and card symbol definitions.

**Table 1-4 Slot and Card Symbols**

Symbol Color/Shape	Definition
Orange/Circle	Slots 1 to 6 and 12 to 17. Only install ONS 15454 SDH cards with a circle symbol on the faceplate.
Blue/Triangle	Slots 5, 6, 12, and 13. Only install ONS 15454 SDH cards with circle or a triangle symbol on the faceplate.
Purple/Square	TCC2/TCC2P slot, Slots 7 and 11. Only install ONS 15454 SDH cards with a square symbol on the faceplate.
Green/Cross	Cross-connect (XC-VXL-2.5G/XC-VXL-10G/XC10G) slot, that is, Slots 8 and 10. Only install ONS 15454 SDH cards with a cross symbol on the faceplate.
Red/P	Protection slot in 1:N protection schemes.
Red/Diamond	AIC-I slot, that is, Slot 9. Only install ONS 15454 SDH cards with a diamond symbol on the faceplate.
Gold/Star	Slots 1 to 4 and 14 to 17. Only install ONS 15454 SDH cards with a star symbol on the faceplate.

Table 1-5 lists the number of ports, line rates, connector options, and connector locations for ONS 15454 SDH optical and electrical cards.

**Table 1-5 Card Ports, Line Rates, and Connectors**

Card	Ports	Line Rate per Port	Connector Types	Connector Location
E1-N-14	14	2.048 Mbps	1.0/2.3 miniature coax connector or DB-37	EFCA
E1-42	14	2.048 Mbps	1.0/2.3 miniature coax connector or Molex 96-pin LFH connector	EFCA
E3-12	12	34.386 Mbps	1.0/2.3 miniature coax connector	EFCA
DS3i-N-12	12	44.736 Mbps	1.0/2.3 miniature coax connector	EFCA
STM1E-12	12	Configurable 155.52 Mbps or 139.264 Mbps	1.0/2.3 miniature coax connector	EFCA

**Table 1-5 Card Ports, Line Rates, and Connectors (continued)**

<b>Card</b>	<b>Ports</b>	<b>Line Rate per Port</b>	<b>Connector Types</b>	<b>Connector Location</b>
E100T-G	12	100 Mbps	RJ-45	Faceplate
E1000-2-G	2	1 Gbps	SC (GBIC)	Faceplate
G1000-4	4	1 Gbps	SC (GBIC)	Faceplate
G1K-4	4	1 Gbps	SC (GBIC)	Faceplate
ML100T-12	12	100 Mbps	RJ-45	Faceplate
ML1000-2	2	1 Gbps	LC (SFP)	Faceplate
OC3 IR 4/STM1 SH 1310	4	155.52 Mbps (STM-1)	SC	Faceplate
OC3IR/STM1SH 1310-8	8	155.52 Mbps (STM-1)	LC	Faceplate
OC12 IR/STM4 SH 1310	1	622.08 Mbps (STM-4)	SC	Faceplate
OC12 LR/STM4 LH 1310	1	622.08 Mbps (STM-4)	SC	Faceplate
OC12 LR/STM4 LH 1550	1	622.08 Mbps (STM-4)	SC	Faceplate
OC12 IR/STM4 SH 1310-4	4	622.08 Mbps (STM-4)	SC	Faceplate
OC48 IR/STM16 SH AS 1310	1	2488.32 Mbps (STM-16)	SC	Faceplate
OC48 LR/STM16 LH AS 1550	1	2488.32 Mbps (STM-16)	SC	Faceplate
OC48 ELR/STM16 EH 100 GHz	1	2488.32 Mbps (STM-16)	SC	Faceplate
OC192 SR/STM64 IO 1310	1	9.95 Gbps (STM-64)	SC	Faceplate
OC192 IR/STM64 SH 1550	1	9.95 Gbps (STM-64)	SC	Faceplate
OC192 LR/STM64 LH 1550	1	9.95 Gbps (STM-64)	SC	Faceplate
OC192 LR/STM64 LH ITU 15xx.xx	1	9.95 Gbps (STM-64)	SC	Faceplate
FC_MR-4	4 (only 2 available in R4.6)	1.0625 Gbps	SC	Faceplate

## 1.12.2 Card Replacement

To replace an ONS 15454 SDH card with another card of the same type, you do not need to make any changes to the database; remove the old card and replace it with a new card. To replace a card with a card of a different type, physically remove the card and replace it with the new card, then delete the original card from CTC. For specifics, refer to the *Cisco ONS 15454 SDH Procedure Guide*.



### Caution

Removing any active card from the ONS 15454 SDH can result in traffic interruption. Use caution when replacing cards and verify that only inactive or standby cards are being replaced. If the active card needs to be replaced, switch it to standby prior to removing the card from the node. For traffic switching procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*.



### Note

An improper removal (IMPROPRMVL) alarm is raised whenever a card pull (reseat) is performed, unless the card is deleted in CTC first. The alarm clears after the card replacement is complete.



### Note

In a subnetwork connection protection (SNCP), pulling the active XC10G without a lockout causes SNCP circuits to switch.

## 1.13 Software and Hardware Compatibility

Table 1-6 shows ONS 15454 SDH software and hardware compatibility for systems configured with XC-VXL-2.5G cards for Releases 3.4, 4.0, 4.1, 4.6, and 5.0.

**Table 1-6 ONS 15454 SDH Software Release/Hardware Compatibility—XC-VXL-2.5G Configurations**

Hardware	3.40.0x (3.4)	4.0.0x (4.0) 4.1.0x (4.1)	4.6.0x (4.6)	5.0.0x (5.0)
XC-VXL-2.5G	Not Supported	Fully Compatible	Fully Compatible	Fully Compatible
TCC2	Not Supported	TCC2 or TCC2P Required	TCC2 or TCC2P Required	TCC2 or TCC2P Required
TCC2P	Not Supported	TCC2 or TCC2P Required	TCC2 or TCC2P Required	TCC2 or TCC2P Required
AIC-I	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
E1N-14	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17
E1-42	Not Supported	Supported in Slots 1– 4, 14–17	Supported in Slots 1– 4, 14–17	Supported in Slots 1– 4, 14–17
E3-12	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17
DS3i-N-12	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17	Supported in Slots 1– 5, 13–17
STM1E-12	Not Supported	Not Supported	Not Supported	Supported in Slots 1– 4, 14–17



**Table 1-6** ONS 15454 SDH Software Release/Hardware Compatibility—XC-VXL-2.5G Configurations (continued)

Hardware	3.40.0x (3.4)	4.0.0x (4.0) 4.1.0x (4.1)	4.6.0x (4.6)	5.0.0x (5.0)
E100T-G	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
E1000-2-G	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
G1000-4	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
G1K-4	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
ML100T-12	Not Supported	Fully Compatible	Fully Compatible	Fully Compatible
ML1000-2	Not Supported	Fully Compatible	Fully Compatible	Fully Compatible
OC3 IR 4/STM1 SH 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC3IR/STM1SH 1310-8	Not Supported	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17
OC12 IR/STM4 SH 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC12 LR/STM4 LH 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC12 LR/STM4 LH 1550	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC12 IR/STM4 SH 1310-4	Supported in Slots 1– 4, 14–17	Supported in Slots 1– 4, 14–17	Supported in Slots 1– 4, 14–17	Supported in Slots 1– 4, 14–17
OC48 IR/STM16 SH AS 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC48 LR/STM16 LH AS 1550	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC48 ELR/STM16 EH 100 GHz	Supported in Slots 5-6, 12-13	Supported in Slots 5-6, 12-13	Supported in Slots 5-6, 12-13	Supported in Slots 5-6, 12-13
OC192 SR/STM64 IO 1310	Not Supported	Not Supported	Not Supported	Not Supported
OC192 IR/STM64 SH 1550	Not Supported	Not Supported	Not Supported	Not Supported
OC192 LR/STM64 LH 1550	Not Supported	Not Supported	Not Supported	Not Supported
OC192 LR/STM64 LH ITU 15xx.xx	Not Supported	Not Supported	Not Supported	Not Supported
FC_MR-4	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible

Table 1-7 shows ONS 15454 SDH software and hardware compatibility for systems configured with XC10G and XC-VXL-10G cards for Releases 3.4, 4.0, 4.1, 4.6, and 5.0. Release 4.5 is not supported on the XC10G and XC-VXL-10G cards.

**Table 1-7** ONS 15454 SDH Software Release/Hardware Compatibility—XC10G and XC-VXL-10G Configurations

Hardware	3.40.0x (3.4)	4.0.0x (4.0) 4.1.0x (4.1)	4.6.0x (4.6)	5.0.0x (5.0)
XC-VXL-10G	Not Supported	Fully Compatible	Fully Compatible	Fully Compatible
XC10G	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
TCC2/TCC2P	Not Supported	Required	Required	Required
AIC-I	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible

**Table 1-7 ONS 15454 SDH Software Release/Hardware Compatibility—XC10G and XC-VXL-10G Configurations (continued)**

Hardware	3.40.0x (3.4)	4.0.0x (4.0) 4.1.0x (4.1)	4.6.0x (4.6)	5.0.0x (5.0)
E1N-14	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17
E1-42	Not Supported	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17
E3-12	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17
DS3i-N-12	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17	Fully Compatible, Slots 1 to 5, 13 to 17
STM1E-12	Not Supported	Not Supported	Not Supported	Fully Compatible, Slots 1 to 4, 14 to 17
E100T-G	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
E1000-2-G	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
G1000-4	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
G1K-4	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
ML100T-12	Not Supported	Fully Compatible	Fully Compatible	Fully Compatible
ML1000-2	Not Supported	Fully Compatible	Fully Compatible	Fully Compatible
OC3 IR 4/STM1 SH 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC3IR/STM1SH 1310-8	Not Supported	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17
OC12 IR/STM4 SH 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC12 LR/STM4 LH 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC12 LR/STM4 LH 1550	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC12 IR/STM4 SH 1310-4	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17	Fully Compatible, Slots 1 to 4, 14 to 17
OC48 IR/STM16 SH AS 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC48 LR/STM16 LH AS 1550	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC48 ELR/STM16 EH 100 GHz	Supported in Slots 5-6, 12-13	Supported in Slots 5-6, 12-13	Supported in Slots 5-6, 12-13	Supported in Slots 5-6, 12-13
OC192 SR/STM64 IO 1310	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC192 IR/STM64 SH 1550	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC192 LR/STM64 LH 1550	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
OC192 LR/STM64 LH ITU 15xx.xx	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
TXP_MR_10G	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
MXP_2.5G_10G	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible
FC_MR-4	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible

If an upgrade is required for compatibility, go to the Cisco Technical Assistance Center (Cisco TAC) website at <http://www.cisco.com/tac>.





## Common Control Cards

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This chapter describes the Cisco ONS 15454 SDH common control card functions. It includes descriptions, hardware specifications, and block diagrams for each card. For installation and card turn-up procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [2.1 Common Control Card Overview, page 2-1](#)
- [2.2 TCC2 Card, page 2-4](#)
- [2.3 TCC2P Card, page 2-7](#)
- [2.4 XC10G Card, page 2-10](#)
- [2.5 XC-VXL-10G Card, page 2-12](#)
- [2.6 XC-VXL-2.5G Card, page 2-14](#)
- [2.7 AIC-I Card, page 2-16](#)

## 2.1 Common Control Card Overview

The card overview section summarizes card functions and compatibility.

Each card is marked with a symbol that corresponds to a slot (or slots) on the ONS 15454 SDH shelf assembly. The cards are then installed into slots displaying the same symbols. See the [“1.12.1 Card Slot Requirements”](#) section on [page 1-15](#) for a list of slots and symbols.

### 2.1.1 Card Summary

[Table 2-1](#) shows the ONS 15454 SDH common control cards and summarizes card functions.

**Table 2-1 Common Control Cards for the ONS 15454 SDH**

Card	Description	For Additional Information...
<b>TCC2</b>	The Advanced Timing, Communications, and Control (TCC2) card is the main processing center of the ONS 15454 SDH and provides system initialization, provisioning, alarm reporting, maintenance, and diagnostics.	See the <a href="#">“2.2 TCC2 Card” section on page 2-4.</a>
<b>TCC2P</b>	The Advanced Timing, Communications, and Control Plus (TCC2P) card is the main processing center of the ONS 15454 SDH and provides system initialization, provisioning, alarm reporting, maintenance, and diagnostics. This card also has Ethernet security features.	See the <a href="#">“2.3 TCC2P Card” section on page 2-7.</a>
<b>XC10G</b>	The 10 Gigabit Cross Connect (XC10G) card is the central element for switching; it establishes connections and performs time-division switching (TDS).	See the <a href="#">“2.4 XC10G Card” section on page 2-10.</a>
<b>XC-VXL-10G</b>	The International Cross Connect 10 Gigabit AU3/AU4 High-Capacity Tributary (XC-VXL-10G) card is the central element for switching; it establishes connections and performs TDS. It supports cards with speeds up to 10 Gbps.	See the <a href="#">“2.5 XC-VXL-10G Card” section on page 2-12.</a>
<b>XC-VXL-2.5G</b>	The International Cross Connect 2.5 Gigabit AU3/AU4 High-Capacity Tributary (XC-VXL-2.5G) card is the central element for switching; it establishes connections and performs TDS. It supports cards with speeds up to 2.5 Gbps.	See the <a href="#">“2.6 XC-VXL-2.5G Card” section on page 2-14.</a>
<b>AIC-I</b>	The Alarm Interface Controller–International (AIC-I) card provides customer-defined alarm input/output (I/O), supports user data, and supports local and express orderwire.	See the <a href="#">“2.7 AIC-I Card” section on page 2-16.</a>

## 2.1.2 Card Compatibility

[Table 2-2](#) lists the Cisco Transport Controller (CTC) software release compatibility for each common-control card. In the tables below, “Yes” means cards are compatible with the listed software versions. Table cells with dashes mean cards are not compatible with the listed software versions.

**Table 2-2 Common-Control Card Software Release Compatibility**

Card	R4.0	R4.1	R4.5	R4.6	R4.7	R5.0
<b>TCC2</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>TCC2P</b>	Yes	Yes	Yes	Yes	Yes	Yes

**Table 2-2 Common-Control Card Software Release Compatibility (continued)**

Card	R4.0	R4.1	R4.5	R4.6	R4.7	R5.0
<b>XC10G</b>	Yes	Yes	—	Yes	Yes	Yes
<b>XC-VXL-10G</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>XC-VXL-2.5G</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>AIC-I</b>	Yes	Yes	Yes	Yes	Yes	Yes

## 2.1.3 Cross-Connect Card Compatibility

The following tables list the compatible cross-connect cards for each Cisco ONS 15454 SDH common-control card. The tables are organized according to type of common-control card. In the tables below, “Yes” means cards are compatible with the listed cross-connect card. Table cells with dashes mean cards are not compatible with the listed cross-connect card.

[Table 2-3](#) lists the cross-connect card compatibility for each common-control card.

**Table 2-3 Common-Control Card Cross-Connect Compatibility**

Card	XC10G Card	XC-VXL-2.5G Card	XC-VXL-10G Card
<b>TCC2</b>	Yes	Yes	Yes
<b>TCC2P</b>	Yes	Yes	Yes
<b>XC-VXL-10G</b>	—	—	Yes
<b>XC-VXL-2.5G</b>	—	Yes	—
<b>XC10G</b>	Yes <sup>1</sup>	—	—
<b>AIC-I</b>	Yes	Yes	Yes

1. The XC10G card requires a TCC2/TCC2P card and Software R3.1 or later to operate.

[Table 2-4](#) lists the cross-connect card compatibility for each electrical card.

**Table 2-4 Electrical Card Cross-Connect Compatibility**

Electrical Card	XC10G Card <sup>1</sup>	XC-VXL-2.5G Card	XC-VXL-10G Card
<b>E1-N-14</b>	Yes	Yes	Yes
<b>E1-42</b>	Yes	Yes	Yes
<b>E3-12</b>	Yes	Yes	Yes
<b>DS3i-N-12</b>	Yes	Yes	Yes
<b>STM1E-12</b>	Yes	Yes	Yes

1. The XC10G card requires a TCC2/TCC2P card and Software R3.1 or later to operate.

Table 2-5 lists the cross-connect card compatibility for each optical card.

**Table 2-5 Optical Card Cross-Connect Compatibility**

Optical Card	XC10G Card	XC-VXL-2.5G Card	XC-VXL-10G Card
OC3 IR 4/STM1 SH 1310	Yes	Yes	Yes
OC3 IR/STM1SH 1310-8	Yes	Yes	Yes
OC12 IR/STM4 SH 1310	Yes	Yes	Yes
OC12 LR/STM4 LH 1310	Yes	Yes	Yes
OC12 LR/STM4 LH 1550	Yes	Yes	Yes
OC12 IR/STM4 SH 1310-4	Yes	Yes	Yes
OC48 IR/STM16 SH AS 1310	Yes	Yes	Yes
OC48 LR/STM16 LH AS 1550	Yes	Yes	Yes
OC48 ELR/STM16 EH 100 GHz	Yes	Yes	Yes
OC192 SR/STM64 IO 1310	Yes	—	Yes
OC192 IR/STM64 SH 1550	Yes	—	Yes
OC192 LR/STM64 LH 1550	Yes	—	Yes
OC192 LR/STM64 LH ITU 15xx.xx	Yes	Yes	Yes

Table 2-6 lists the cross-connect card compatibility for each Ethernet card.

**Table 2-6 Ethernet Card Cross-Connect Compatibility**

Ethernet Cards	XC10G Card	XC-VXL-2.5G Card	XC-VXL-10G Card
E100T-G	Yes	Yes	Yes
E1000-2-G	Yes	Yes	Yes
G1000-4	Yes	Yes	Yes
G1K-4	Yes	Yes	Yes
ML100T-12	Yes	Yes	Yes
ML1000-2	Yes	Yes	Yes

## 2.2 TCC2 Card

The TCC2 card, which requires Software Release 4.0 or later, performs system initialization, provisioning, alarm reporting, maintenance, diagnostics, IP address detection/resolution, SDH section overhead (SOH) data communications channel/generic communication channel (DCC/GCC) termination, and system fault detection for the ONS 15454 SDH. The TCC2 card also ensures that the system maintains Stratum 3 (ITU-T G.812) timing requirements. It monitors the supply voltage of the system.



**Note**

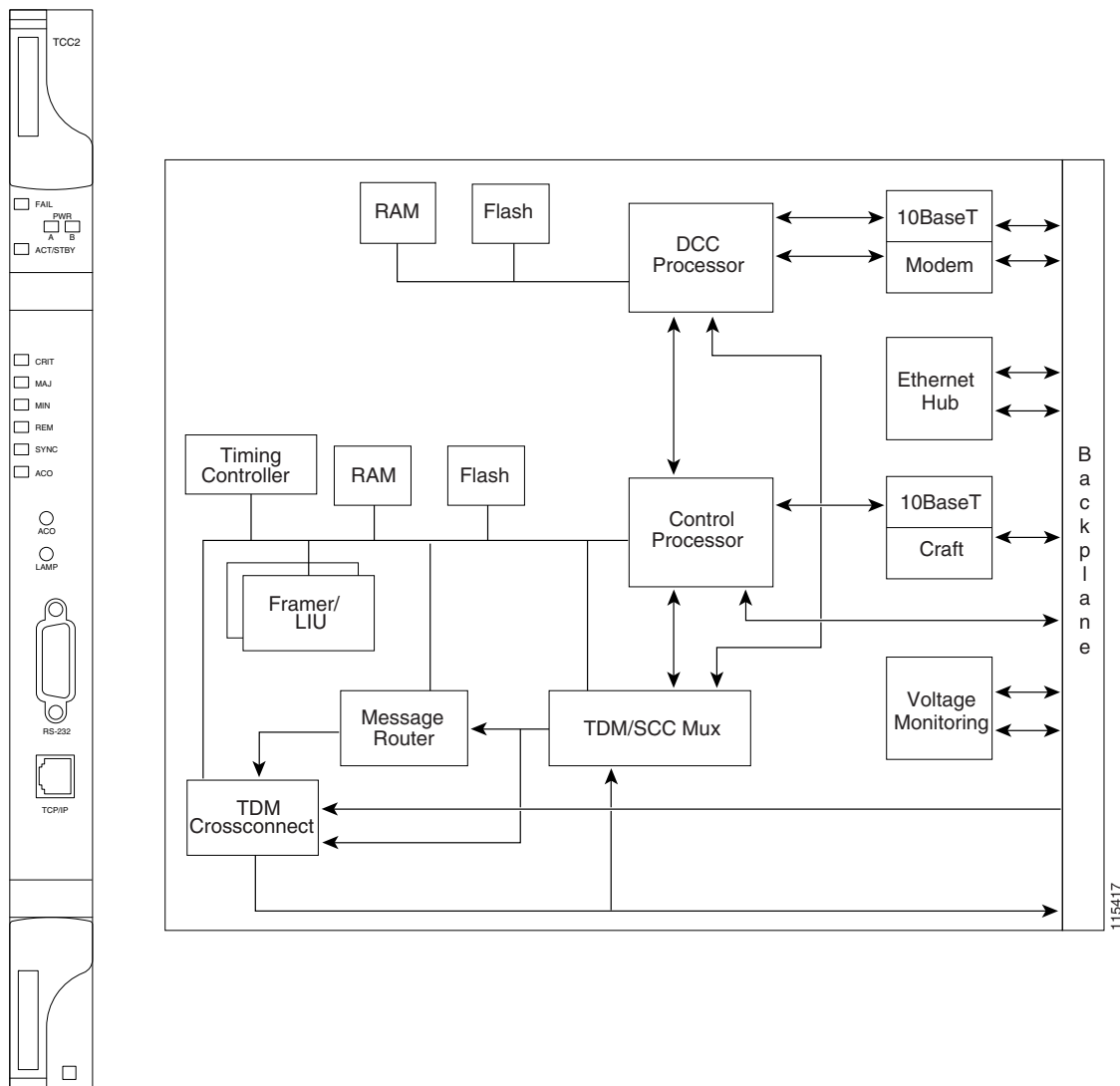
The LAN interfaces of the TCC2 card meet the standard Ethernet specifications by supporting a cable length of 100 m (328 ft.) at temperatures from 0 to 65 degrees Celsius (32 to 149 degrees Fahrenheit). The interfaces can operate with a cable length of 10 m (32.8 ft) maximum at temperatures from -40 to 0 degrees Celsius (-40 to 32 degrees Fahrenheit).

**Note**

The TCC2 card support both -48 VDC and -60 VDC input requirements.

Figure 2-1 shows the TCC2 card faceplate and block diagram.

**Figure 2-1 TCC2 Faceplate and Block Diagram**



## 2.2.1 TCC2 Card Functionality

The TCC2 card supports multichannel, high-level data link control (HDLC) processing for the DCC/GCC. Up to 84 DCCs can be routed over the TCC2 card and up to 84 section DCCs can be terminated at the TCC2 card (subject to the available optical digital communication channels). The TCC2 card selects and processes 84 DCCs to facilitate remote system management interfaces.

The TCC2 card also originates and terminates a cell bus carried over the module. The cell bus supports links between any two cards in the node, which is essential for peer-to-peer communication. Peer-to-peer communication accelerates protection switching for redundant cards.

The node database, IP address, and system software are stored in TCC2 card nonvolatile memory, which allows quick recovery in the event of a power or card failure.

The TCC2 card performs all system-timing functions for each ONS 15454 SDH. It monitors the recovered clocks from each traffic card and two BITS ports for frequency accuracy. The TCC2 card selects a recovered clock, a BITS, or an internal Stratum 3 reference as the system-timing reference. You can provision any of the clock inputs as primary or secondary timing sources. A slow-reference tracking loop allows the TCC2 card to synchronize with the recovered clock, which provides holdover if the reference is lost.

The TCC2 card monitors both supply voltage inputs on the shelf. An alarm is generated if one of the supply voltage inputs has a voltage outside of the specified range.

Install TCC2 cards in Slots 7 and 11 for redundancy. If the active TCC2 card fails, traffic switches to the protect TCC2 card. All TCC2 card protection switches conform to protection switching standards when the bit error rate (BER) counts are not in excess of  $1 * 10 \text{ exp} - 3$  and completion time is less than 50 ms.

The TCC2 card has two built-in interface ports for accessing the system: an RJ-45 10BaseT LAN interface and an EIA/TIA-232 interface for local craft access. It also has a 10BaseT LAN port for user interfaces via the backplane to the port accessible on the MIC-C/T/P Front Mount Electrical Connection (FMEC).

Cisco does not support operation of the ONS 15454 SDH with only one TCC2 card. For full functionality and to safeguard your system, always operate each ONS 15454 SDH with two TCC2 cards.



### Note

CTC software does not monitor for the absence of FMECs unless the TCC2 card(s) have reached the Active/Standby state. During transitional states such as power-up or TCC2 card reset, CTC ignores the FMEC inventory displayed in node view.



### Note

When a second TCC2 card is inserted into a node, it synchronizes its software, its backup software, and its database with the active TCC2 card. If the software version of the new TCC2 card does not match the version on the active TCC2 card, the newly inserted TCC2 card copies from the active TCC2 card, taking about 15 to 20 minutes to complete. If the backup software version on the new TCC2 card does not match the version on the active TCC2 card, the newly inserted TCC2 card copies the backup software from the active TCC2 card again, taking about 15 to 20 minutes. Copying the database from the active TCC2 card takes about 3 minutes. Depending on the software version and backup version the new TCC2 card started with, the entire process can take between 3 and 40 minutes.

## 2.2.2 TCC2 Card-Level Indicators

Table 2-7 describes the two card-level LEDs on the TCC2 card faceplate.

**Table 2-7 TCC2 Card-Level Indicators**

Card-Level LEDs	Definition
Red FAIL LED	The FAIL LED flashes during the boot and write process. Replace the card if the FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	The ACT/STBY (Active/Standby) LED indicates the TCC2 card is active (green) or in standby (amber) mode. The ACT/STBY LED also provides the timing reference and shelf control. When the TCC2 card is writing to the active or standby TCC2 card, its active or standby LED blinks. To avoid memory corruption, do not remove the TCC2 card when the active or standby LED is blinking.

## 2.2.3 Network-Level Indicators

Table 2-8 describes the six network-level LEDs on the TCC2 card faceplate.

**Table 2-8 TCC2 Network-Level Indicators**

System-Level LEDs	Definition
Red CRIT LED	Indicates Critical alarms in the network at the local terminal.
Red MAJ LED	Indicates Major alarms in the network at the local terminal.
Amber MIN LED	Indicates Minor alarms in the network at the local terminal.
Red REM LED	Provides first-level alarm isolation. The remote (REM) LED turns red when an alarm is present in one or several of the remote terminals.
Green SYNC LED	Indicates that node timing is synchronized to an external reference.
Green ACO LED	After pressing the alarm cutoff (ACO) button, the green ACO LED illuminates. The ACO button opens the audible closure on the backplane. ACO state is stopped if a new alarm occurs. After the originating alarm is cleared, the ACO LED and audible alarm control are reset.

## 2.3 TCC2P Card

The TCC2P card, which requires Software R4.0 or later, is an enhanced version of the TCC2 card. The primary enhancements are Ethernet security features.

The TCC2P card performs system initialization, provisioning, alarm reporting, maintenance, diagnostics, IP address detection/resolution, SONET SOH DCC/GCC termination, and system fault detection for the ONS 15454. The TCC2P also ensures that the system maintains Stratum 3 (Telcordia GR-253-CORE) timing requirements. It monitors the supply voltage of the system.

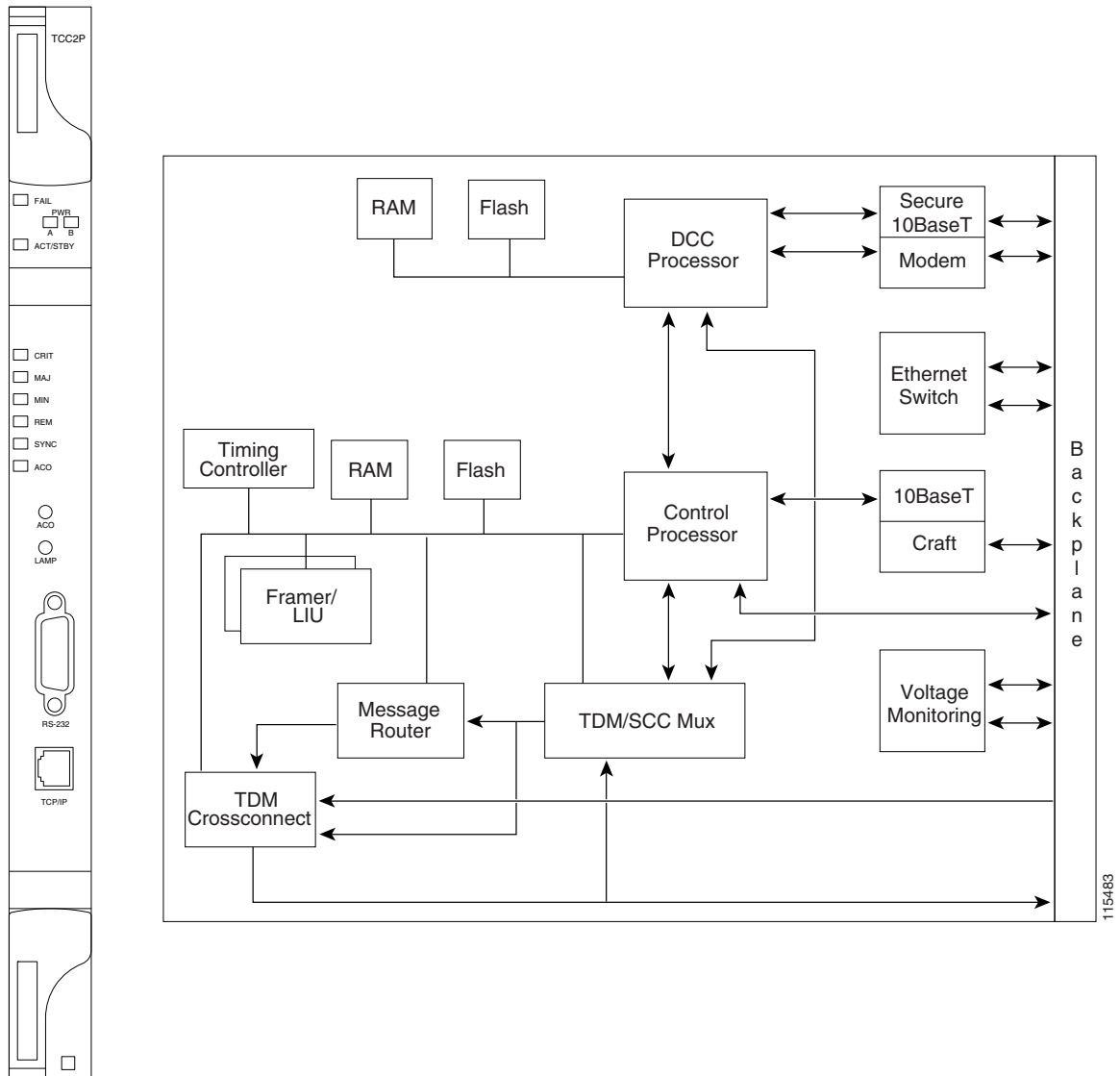


### Note

The LAN interface of the TCC2P card meets the standard Ethernet specifications by supporting a cable length of 328 ft (100 m) at temperatures from 32 to 149 degrees Fahrenheit (0 to 65 degrees Celsius). The interfaces can operate with a cable length of 32.8 ft (10 m) maximum at temperatures from -40 to 32 degrees Fahrenheit (-40 to 0 degrees Celsius).

Figure 2-2 shows the faceplate and block diagram for the TCC2P.

**Figure 2-2** TCC2P Faceplate and Block Diagram



## 2.3.1 TCC2P Functionality

The TCC2P card supports multichannel, HDLC processing for the DCC. Up to 84 DCCs can be routed over the TCC2P card and up to 84 section DCCs can be terminated at the TCC2P card (subject to the available optical digital communication channels). The TCC2P selects and processes 84 DCCs to facilitate remote system management interfaces.

The TCC2P also originates and terminates a cell bus carried over the module. The cell bus supports links between any two cards in the node, which is essential for peer-to-peer communication. Peer-to-peer communication accelerates protection switching for redundant cards.

The node database, IP address, and system software are stored in TCC2P nonvolatile memory, which allows quick recovery in the event of a power or card failure.

The TCC2P card performs all system-timing functions for each ONS 15454. It monitors the recovered clocks from each traffic card and two BITS ports for frequency accuracy. The TCC2P card selects a recovered clock, a BITS, or an internal Stratum 3 reference as the system-timing reference. You can provision any of the clock inputs as primary or secondary timing sources. A slow-reference tracking loop allows the TCC2P to synchronize with the recovered clock, which provides holdover if the reference is lost.

The TCC2P monitors both supply voltage inputs on the shelf. An alarm is generated if one of the supply voltage inputs has a voltage out of the specified range.

Install TCC2P cards in Slots 7 and 11 for redundancy. If the active TCC2P fails, traffic switches to the protect TCC2P. All TCC2P protection switches conform to protection switching standards when the BER counts are not in excess of  $1 * 10 \text{ exp} - 3$  and completion time is less than 50 ms.

The TCC2P card has two built-in RJ-45 Ethernet interface ports for accessing the system: one on the front faceplate for on-site craft access and a second on the backplane for user interfaces. The rear Ethernet interface is for permanent LAN access and all remote access via TCP/IP as well as for Operations Support System (OSS) access. The front and rear Ethernet interfaces have different IP addresses that are in different subnets.

Two EIA/TIA-232 serial ports, one on the faceplate and a second on the backplane, allow for craft interface in TL1 mode.

Cisco does not support operation of the ONS 15454 SDH with only one TCC2P card. For full functionality and to safeguard your system, always operate with two TCC2P cards.



**Note**

When a second TCC2P card is inserted into a node, it synchronizes its software, its backup software, and its database with the active TCC2P. If the software version of the new TCC2P does not match the version on the active TCC2P, the newly inserted TCC2P copies from the active TCC2P, taking about 15 to 20 minutes to complete. If the backup software version on the new TCC2P does not match the version on the active TCC2P, the newly inserted TCC2P copies the backup software from the active TCC2P again, taking about 15 to 20 minutes. Copying the database from the active TCC2P takes about 3 minutes. Depending on the software version and backup version the new TCC2P started with, the entire process can take between 3 and 40 minutes.

## 2.3.2 TCC2P Card-Level Indicators

The TCC2P faceplate has eight LEDs. [Table 2-9](#) describes the two card-level LEDs on the TCC2P faceplate.

**Table 2-9 TCC2P Card-Level Indicators**

Card-Level LEDs	Definition
Red FAIL LED	This LED is on during reset. The FAIL LED flashes during the boot and write process. Replace the card if the FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	Indicates the TCC2P is active (green) or in standby (amber) mode. The ACT/STBY LED also provides the timing reference and shelf control. When the active TCC2P is writing to its database or to the standby TCC2P database, the card LEDs blink. To avoid memory corruption, do not remove the TCC2P when the active or standby LED is blinking.

## 2.3.3 Network-Level Indicators

Table 2-10 describes the six network-level LEDs on the TCC2P faceplate.

**Table 2-10** TCC2P Network-Level Indicators

System-Level LEDs	Definition
Red CRIT LED	Indicates critical alarms in the network at the local terminal.
Red MAJ LED	Indicates major alarms in the network at the local terminal.
Amber MIN LED	Indicates minor alarms in the network at the local terminal.
Red REM LED	Provides first-level alarm isolation. The remote (REM) LED turns red when an alarm is present in one or more of the remote terminals.
Green SYNC LED	Indicates that node timing is synchronized to an external reference.
Green ACO LED	After pressing the ACO button, the ACO LED turns green. The ACO button opens the audible alarm closure on the backplane. ACO is stopped if a new alarm occurs. After the originating alarm is cleared, the ACO LED and audible alarm control are reset.

## 2.4 XC10G Card

The XC10G card cross connects STM-1, STM-4, STM-16, and STM-64 signal rates. The XC10G card provides a maximum of 384 x 384 VC-4 nonblocking cross connections. Any STM-1 on any port can be connected to any other port, meaning that the STM cross-connections are nonblocking.

The lowest level cross-connect with the XC10G card is STM-1. Lower level signals, such as E-1, DS-3, or E-3, can be dropped, which can leave part of the bandwidth unused.



**Note**

The XC10G card has been designed to support both –48 VDC and –60 VDC input requirements.

Figure 2-3 shows the XC10G card faceplate and block diagram.

**Figure 2-3 XC10G Card Faceplate and Block Diagram**

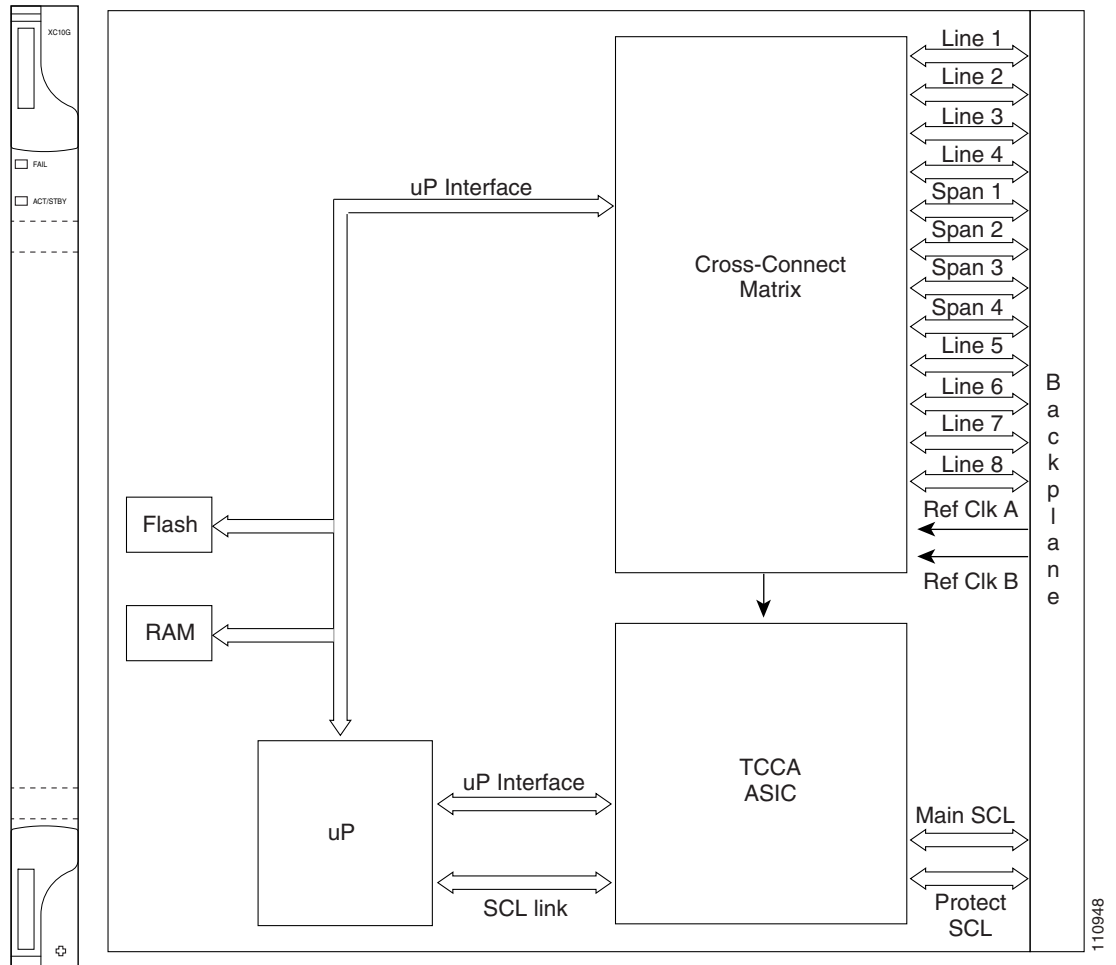
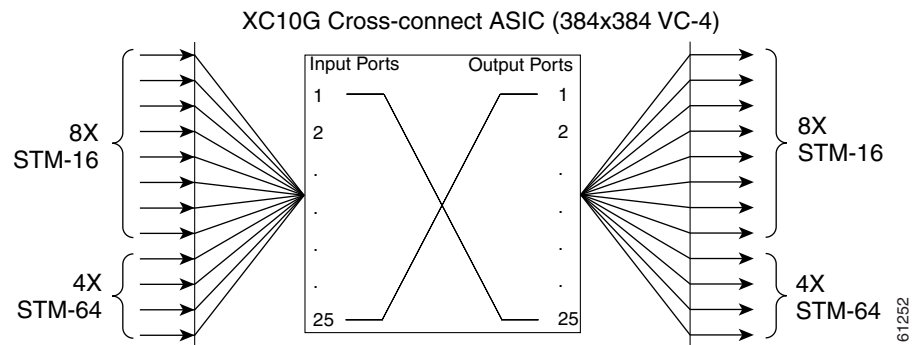


Figure 2-4 shows the XC10G card cross-connect matrix.

**Figure 2-4 XC10G Card Cross-Connect Matrix**



## 2.4.1 XC10G Functionality

The XC10G card manages up to 192 bidirectional STM-1 cross-connects. The TCC2/TCC2P card assigns bandwidth to each slot on a per STM-1 basis. The XC10G card works with the TCC2/TCC2P card to maintain connections and set up cross-connects within the system. You can establish cross-connect and provisioning information through the CTC.


**Note**

Cisco does not recommend operating the ONS 15454 SDH with only one XC10G card. To safeguard your system, always operate in a redundant configuration. Install XC10G cards in Slots 8 and 10.

## 2.4.2 XC10G Card-Level Indicators

Table 2-11 describes the two card-level LEDs on the XC10G card faceplate.

**Table 2-11** XC10G Card-Level Indicators

Card-Level LEDs	Definition
Red FAIL LED	Indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	Indicates whether the XC10G card is active and carrying traffic (green) or in standby mode to the active XC10G card (amber).

## 2.5 XC-VXL-10G Card

The XC-VXL-10G card cross connects E-1, E-3, DS-3, STM-1, STM-4, STM-16, and STM-64 signal rates. The XC-VXL-10G provides a maximum of 384 x 384 VC-4 nonblocking cross-connections, 384 x 384 VC-3 nonblocking cross-connections, or 2016 x 2016 VC-12 nonblocking cross-connections. It is designed for 10-Gbps solutions.


**Note**

The XC-VXL-10G card has been designed to support both -48 VDC and -60 VDC input requirements.



Figure 2-5 shows the XC-VXL-10G faceplate and block diagram.

**Figure 2-5 XC-VXL-10G Faceplate and Block Diagram**

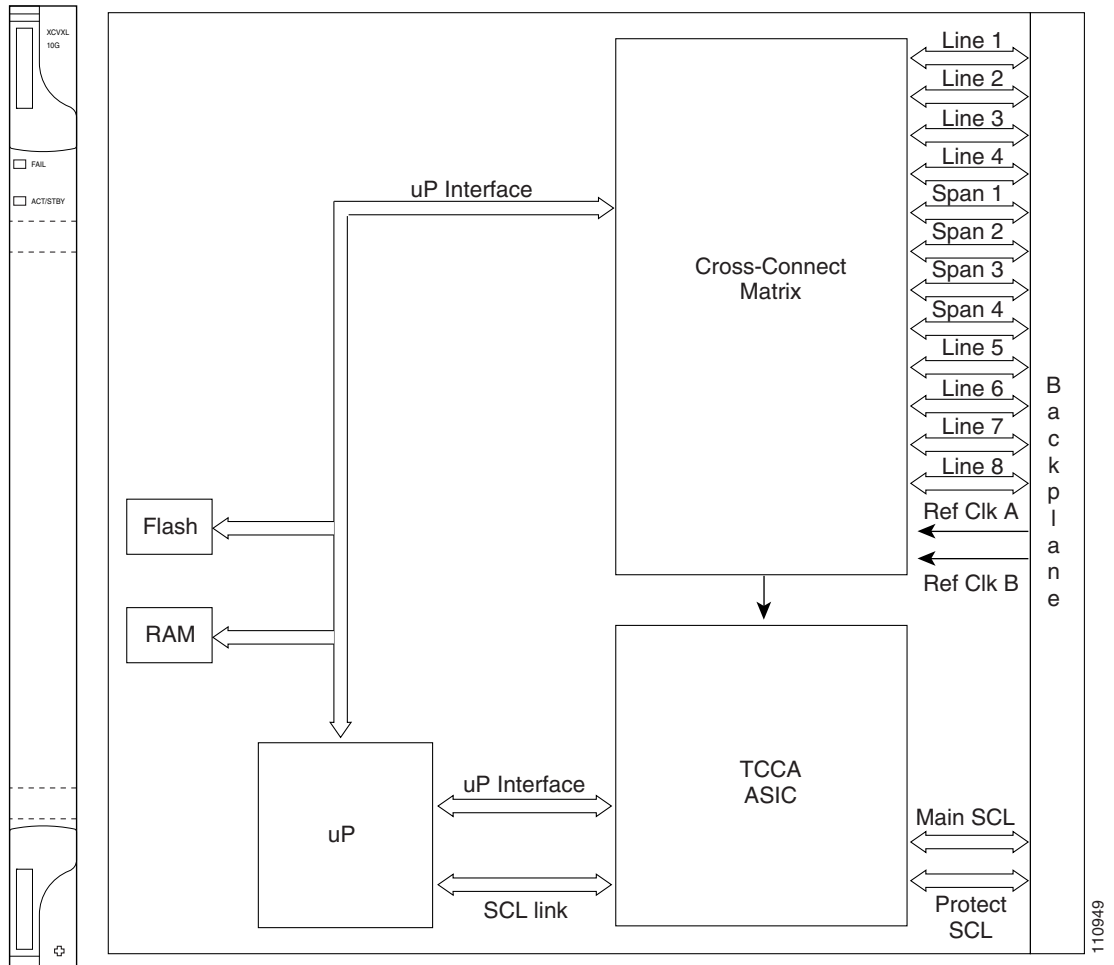
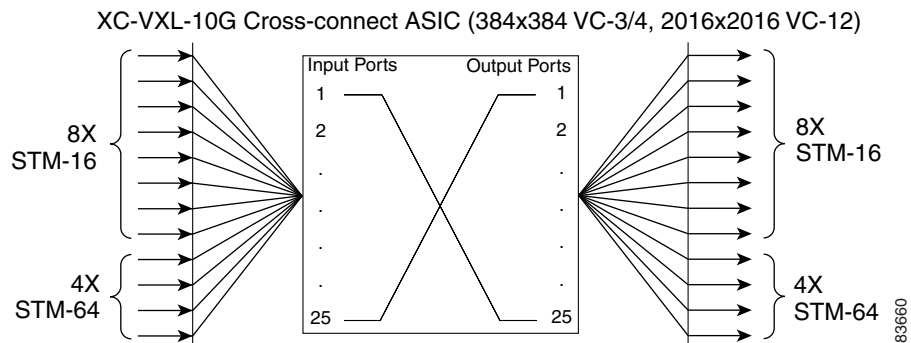


Figure 2-6 shows the XC-VXL-10G cross-connect matrix.

**Figure 2-6 XC-VXL-10G Cross-Connect Matrix**



## 2.5.1 XC-VXL-10G Functionality

The XC-VXL-10G card manages up to 192 bidirectional STM-1 cross-connects, 192 bidirectional E-3 or DS-3 cross-connects, or 1008 bidirectional E-1 cross-connects. The TCC2/TCC2P card assigns bandwidth to each slot on a per STM-1 basis. The XC-VXL-10G card works with the TCC2/TCC2P card to maintain connections and set up cross-connects within the node. You can establish cross-connect and provisioning information through CTC.


**Note**

Cisco does not recommend operating the ONS 15454 SDH with only one XC-VXL-10G card. To safeguard your node, always operate in a redundant configuration. Install the XC-VXL-10 cards in Slots 8 and 10.

## 2.5.2 XC-VXL-10G Card-Level Indicators

Table 2-12 describes the two card-level LEDs on the XC-VXL-10G card faceplate.

**Table 2-12 XC-VXL-10G Card-Level Indicators**

Card-Level LEDs	Definition
Red FAIL LED	Indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	Indicates whether the XC-VXL-10G card is active and carrying traffic (green) or in standby mode to the active XC-VXL-10G card (amber).

## 2.6 XC-VXL-2.5G Card

The XC-VXL-2.5G card cross-connects E-1, E-3, DS-3, STM-1, STM-4, STM-16, and STM-64 signal rates. The XC-VXL-2.5G card provides a maximum of 192 x 192 VC-4 nonblocking cross-connections, 384 x 384 VC-3 nonblocking cross-connections, or 2016 x 2016 VC-12 nonblocking cross-connections. The card is designed for 2.5-Gbps solutions.


**Note**

The XC-VXL-2.5G card has been designed to support both -48 VDC and -60 VDC input requirements.

Figure 2-7 shows the XC-VXL-2.5G card faceplate and block diagram.

**Figure 2-7 XC-VXL-2.5G Faceplate and Block Diagram**

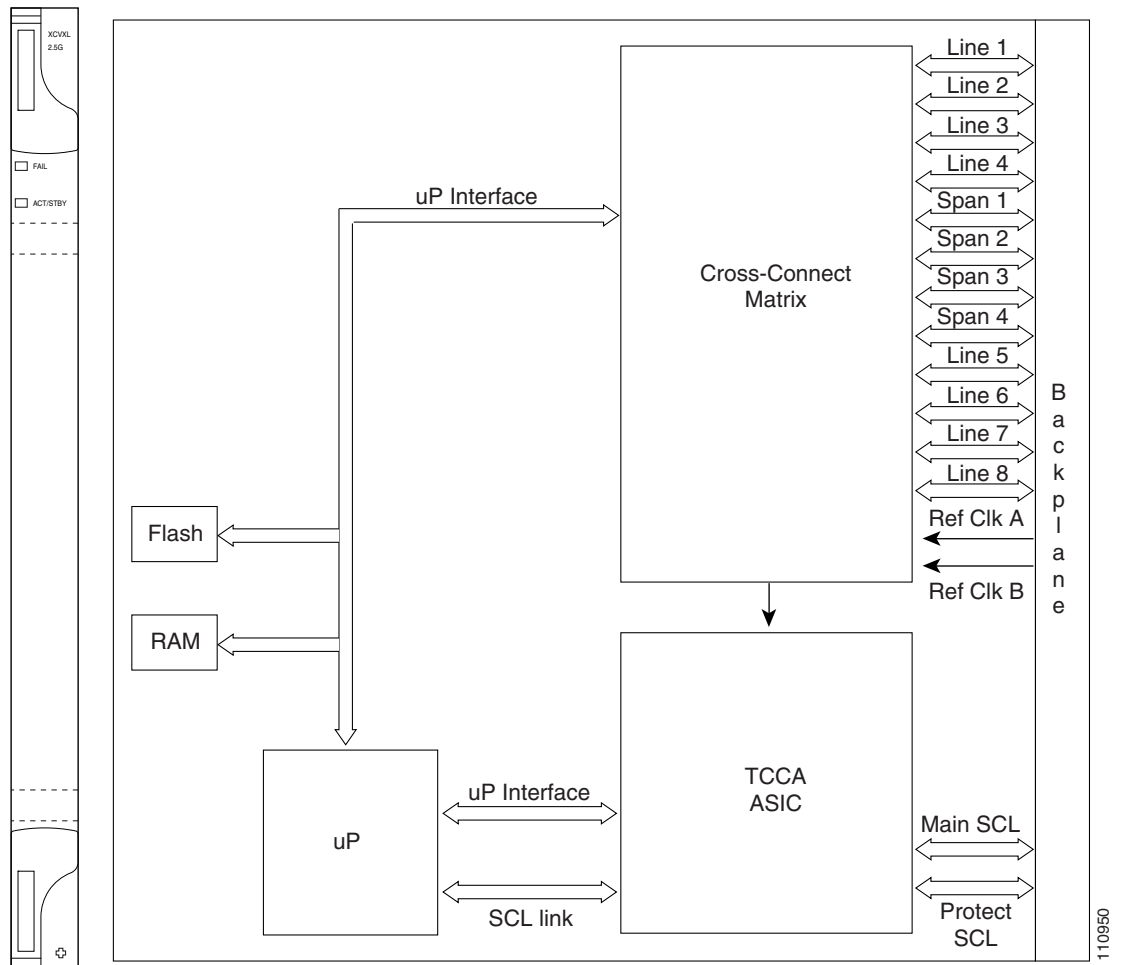
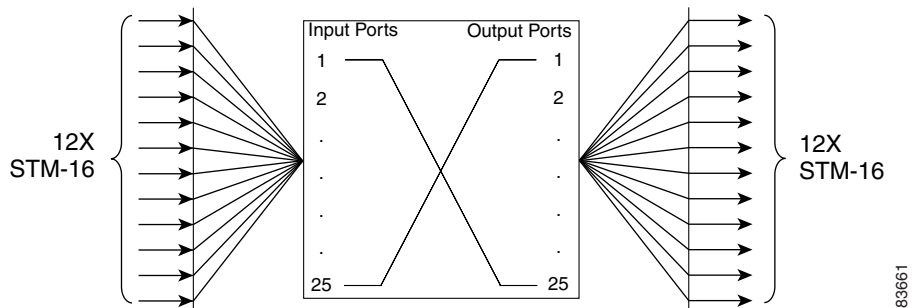


Figure 2-8 shows the XC-VXL-2.5G cross-connect matrix.

**Figure 2-8 XC-VXL-2.5G Cross-Connect Matrix**

XC-VXL-2.5G Cross-connect ASIC (192x192 VC-4, 384x384 VC-3, 2016x2016 VC-12)



## 2.6.1 XC-VXL-2.5G Card Functionality

The XC-VXL-2.5G card manages up to 192 bidirectional STM-1 cross-connects, 192 bidirectional E-3 or DS-3 cross-connects, or 1008 bidirectional E-1 cross-connects. The TCC2/TCC2P card assigns bandwidth to each slot on a per STM-1 basis. The XC-VXL-2.5G card works with the TCC2/TCC2P card to maintain connections and set up cross-connects within the node. You can establish cross-connect and provisioning information through CTC.


**Note**

Cisco does not recommend operating the ONS 15454 SDH with only one XC-VXL-2.5G card. To safeguard your system, always operate in a redundant configuration. Install the XC-VXL-2.5G cards in Slots 8 and 10.

## 2.6.2 XC-VXL-2.5G Card-Level Indicators

Table 2-13 describes the two card-level LEDs on the XC-VXL-2.5G faceplate.

**Table 2-13** XC-VXL-2.5G Card-Level Indicators

Card-Level LEDs	Definition
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	The ACT/STBY (Active/Standby) LED indicates whether the XC-VXL-2.5G is active and carrying traffic (green) or in standby mode to the active XC-VXL-2.5G card (amber).

## 2.7 AIC-I Card

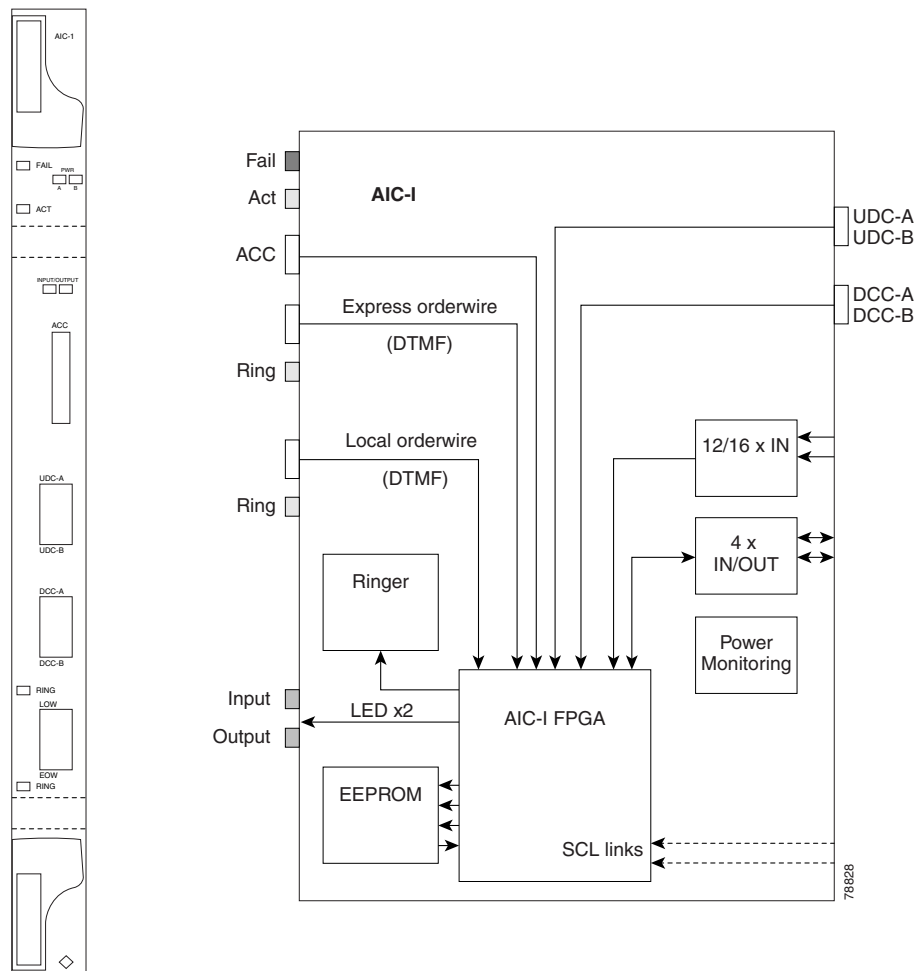
The optional Alarm Interface Controller–International (AIC-I) card provides customer-defined alarm inputs and outputs, user data channels, and supports local and express orderwire. It provides 16 customer-defined input contacts and 4 customer-defined input/output contacts. It requires the MIC-A/P for connection to the alarm contacts.


**Note**

The AIC-I card supports both –48 VDC and –60 VDC input requirements.

Figure 2-9 shows the AIC-I card faceplate and a block diagram of the card.

**Figure 2-9** AIC-I Faceplate and Block Diagram



## 2.7.1 AIC-I Card-Level Indicators

Table 2-14 describes the eight card-level LEDs on the AIC-I card.

**Table 2-14** AIC-I Card-Level Indicators

Card-Level LEDs	Description
Red FAIL LED	Indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
Green ACT LED	Indicates that the AIC-I card is provisioned for operation.
Green/Red PWR A LED	When green, indicates that a supply voltage within the specified range has been sensed on supply input A. It is red when the input voltage on supply input A is out of range.

**Table 2-14** AIC-I Card-Level Indicators (continued)

Card-Level LEDs	Description
Green/Red PWR B LED	When green, indicates that a supply voltage within the specified range has been sensed on supply input B. It is red when the input voltage on supply input B is out of range.
Amber INPUT LED	When amber, indicates that there is an alarm condition on at least one of the alarm inputs.
Amber OUTPUT LED	When amber, indicates that there is an alarm condition on at least one of the alarm outputs.
Green RING LED	The green RING LED on the local orderwire (LOW) side is flashing when a call is received on the LOW.
Green RING LED	The green RING LED on the express orderwire (EOW) side is flashing when a call is received on the EOW.

## 2.7.2 External Alarms and Controls

The AIC-I card provides input/output alarm contact closures. You can define up to 16 external alarm inputs and four external alarm inputs/outputs (user configurable). The physical connections are made using the MIC-A/P. The alarms are defined using CTC. For instructions, refer to the “Manage Alarms” chapter in the *Cisco ONS 15454 SDH Procedure Guide*.

LEDs on the front panel of the AIC-I indicate the status of the alarm contacts: one LED representing all the inputs and one LED representing all the outputs. External alarms (input contacts) are typically used for external sensors such as open doors, temperature sensors, flood sensors, and other environmental conditions. External controls (output contacts) are typically used to drive visual or audible devices such as bells and lights, but they can control other devices such as generators, heaters, and fans.

You can program each of the sixteen input alarm contacts separately. Choices include:

- Alarm on Closure or Alarm on Open
- Alarm severity of any level (Critical, Major, Minor, Not Alarmed, Not Reported)
- Service Affecting or Non-Service Affecting alarm-service level
- 63-character alarm description for CTC display in the alarm log. You cannot assign the fan-tray abbreviation for the alarm; the abbreviation reflects the generic name of the input contacts. The alarm condition remains raised until the external input stops driving the contact or you unprovision the alarm input.

You cannot assign the fan-tray abbreviation for the alarm; the abbreviation reflects the generic name of the input contacts. The alarm condition remains raised until the external input stops driving the contact or you provision the alarm input.

The output contacts can be provisioned to close on a trigger or to close manually. The trigger can be a local alarm severity threshold, a remote alarm severity, or a virtual wire, as follows:

- Local NE alarm severity: A hierarchy of Not Reported, Not Alarmed, Minor, Major, or Critical alarm severities that you set to cause output closure. For example, if the trigger is set to Minor, a Minor alarm or above is the trigger.
- Remote NE alarm severity: Same as the local NE alarm severity but applies to remote alarms only.

- Virtual wire entities: You can provision any environmental alarm input to raise a signal on any virtual wire on external outputs 1 through 4 when the alarm input is an event. You can provision a signal on any virtual wire as a trigger for an external control output.

You can also program the output alarm contacts (external controls) separately. In addition to provisionable triggers, you can manually force each external output contact to open or close. Manual operation takes precedence over any provisioned triggers that might be present.

## 2.7.3 Orderwire

Orderwire allows a craftsperson to plug a phone set into an ONS 15454 SDH and communicate with craftspeople working at other ONS 15454 SDHs or other facility equipment. The orderwire is a pulse code modulation (PCM) encoded voice channel that uses E1 or E2 bytes in the multiplex section overhead and in the regenerator section overhead.

The AIC-I allows simultaneous use of both local (section overhead signal) and express (line overhead signal) orderwire channels on an SDH ring or particular optics facility. Express orderwire also allows communication via regeneration sites when the regenerator is not a Cisco device.

You can provision orderwire functions with CTC similar to the current provisioning model for GCC channels. In CTC, you provision the orderwire communications network during ring turn-up so that all NEs on the ring can communicate with one another. Orderwire terminations (that is, the optics facilities that receive and process the orderwire channels) are provisionable. Both express and local orderwire can be configured as on or off on a particular SDH facility. The ONS 15454 SDH supports up to four orderwire channel terminations per shelf. This allows linear, single ring, dual ring, and small hub-and-spoke configurations. Keep in mind that orderwire is not protected in ring topologies such as multiplex section-shared protection ring (MS-SPRing) and subnetwork connection protection (SNCP).



### Caution

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Do not configure orderwire loops. Orderwire loops cause feedback that disables the orderwire channel.

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The ONS 15454 SDH implementation of both local and express orderwire is broadcast in nature. The line acts as a party line. Anyone who picks up the orderwire channel can communicate with all other participants on the connected orderwire subnetwork. The local orderwire party line is separate from the express orderwire party line. Up to four STM-N facilities for each local and express orderwire are provisionable as orderwire paths.



### Note

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The OC3 IR 4/STM1 SH 1310 card does not support the express orderwire (EOW) channel.

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The AIC-I supports selective dual tone multifrequency (DTMF) dialing for telephony connectivity, which causes specific or all ONS 15454 SDH AIC-I's on the orderwire subnetwork to “ring.” The ringer/buzzer resides on the AIC-I. There is also a “ring” LED that mimics the AIC-I ringer. It flashes when a call is received on the orderwire subnetwork. A party line call is initiated by pressing \*0000 on the DTMF pad. Individual dialing is initiated by pressing \* and the individual four-digit number on the DTMF pad. The station number of the node is provisioned in CTC.

The orderwire ports are standard RJ-11 receptacles. The pins on the orderwire ports correspond to the tip and ring orderwire assignments.

Table 2-15 describes the orderwire pin assignments.

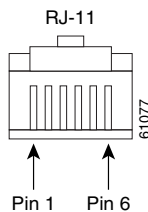
**Table 2-15 Orderwire Pin Assignments**

RJ-11 Pin Number	Description
1	Four-wire receive ring
2	Four-wire transmit tip
3	Two-wire ring
4	Two-wire tip
5	Four-wire transmit ring
6	Four-wire receive tip

When provisioning the orderwire subnetwork, make sure that an orderwire loop does not exist. Loops cause oscillation and an unusable orderwire channel.

Figure 2-10 shows the standard RJ-11 connectors used for orderwire ports. Use a shielded RJ-11 cable.

**Figure 2-10 RJ-11 Cable Connector**



## 2.7.4 Power Monitoring

The AIC-I card provides a power monitoring circuit that monitors the supply voltage of –48 VDC for presence, undervoltage, or overvoltage.

## 2.7.5 User Data Channel

The user data channel (UDC) features a dedicated data channel of 64 kbps (F1 byte) between two nodes in an ONS 15454 SDH network. Each AIC-I card provides two UDCs, UDC-A and UDC-B, through separate RJ-11 connectors on the front of the AIC-I. Each UDC can be routed to an individual optical interface in the ONS 15454 SDH system. For instructions, refer to the “Create Circuits and Low-Order Tunnels” chapter in the *Cisco ONS 15454 SDH Procedure Guide*.

The UDC ports are standard RJ-11 receptacles. Table 2-16 lists the UDC pin assignments.

**Table 2-16 UDC Pin Assignments**

RJ-11 Pin Number	Description
1	For future use
2	TXN



**Table 2-16** UDC Pin Assignments (continued)

RJ-11 Pin Number	Description
3	RXN
4	RXP
5	TXP
6	For future use

## 2.7.6 Data Communications Channel

The DCC features a dedicated data channel of 576 kbps (D4 to D12 bytes) between two nodes in an ONS 15454 SDH network. Each AIC-I card provides two DCCs, DCC-A and DCC-B, through separate RJ-45 connectors on the front of the AIC-I. Each DCC can be routed to an individual optical interface in the ONS 15454 SDH system.


**Note**

DCC connection cannot be provisioned if DCC tunneling is configured on this span.

The DCC ports are standard RJ-45 receptacles. [Table 2-17](#) describes the GCC pin assignments.

**Table 2-17** GCC Pin Assignments

RJ-45 Pin Number	Description
1	TCLKP
2	TCLKN
3	TXP
4	TXN
5	RCLKP
6	RCLKN
7	RXP
8	RXN





## Electrical Cards

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This chapter describes the Cisco ONS 15454 SDH electrical card features and functions. It includes descriptions, hardware specifications, and block diagrams for each card. For installation and card turn-up procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [3.1 Electrical Card Overview, page 3-1](#)
- [3.2 E1-N-14 Card, page 3-4](#)
- [3.3 E1-42 Card, page 3-6](#)
- [3.4 E3-12 Card, page 3-8](#)
- [3.5 DS3i-N-12 Card, page 3-10](#)
- [3.6 STM1E-12 Card, page 3-13](#)
- [3.7 BLANK Card, page 3-14](#)
- [3.8 FMEC-E1 Card, page 3-15](#)
- [3.9 FMEC-DS1/E1 Card, page 3-16](#)
- [3.10 FMEC E1-120NP Card, page 3-18](#)
- [3.11 FMEC E1-120PROA Card, page 3-21](#)
- [3.12 FMEC E1-120PROB Card, page 3-23](#)
- [3.13 E1-75/120 Impedance Conversion Panel, page 3-26](#)
- [3.14 FMEC-E3/DS3 Card, page 3-28](#)
- [3.15 FMEC STM1E 1:1 Card, page 3-29](#)
- [3.16 FMEC-BLANK Card, page 3-29](#)
- [3.17 MIC-A/P FMEC, page 3-30](#)
- [3.18 MIC-C/T/P FMEC, page 3-33](#)

### 3.1 Electrical Card Overview

The card overview section summarizes card functions and compatibility.

**Note**

Each card is marked with a symbol that corresponds to a slot (or slots) on the ONS 15454 shelf assembly. The cards are then installed into slots displaying the same symbols. See the [“1.12.1 Card Slot Requirements” section on page 1-15](#) for a list of slots and symbols.

## 3.1.1 Card Summary

Table 3-1 shows available electrical cards for the ONS 15454 SDH.

**Table 3-1**      **Electrical Cards**

Card	Description	For Additional Information...
E1-N-14	Provides 14 E-1 ports and supports 1:0, 1:1, and 1:N protection. It operates in Slots 1 to 5 and Slots 13 to 17.	See the <a href="#">“3.2 E1-N-14 Card” section on page 3-4</a> .
E1-42	Provides 42 E-1 ports and supports 1:3 protection. It operates in Slots 1 to 4 and Slots 14 to 17.	See the <a href="#">“3.3 E1-42 Card” section on page 3-6</a> .
E3-12	Provides 12 E-3 ports and supports 1:0 and 1:1 protection. It operates in Slots 1 to 5 and Slots 13 to 17.	See the <a href="#">“3.4 E3-12 Card” section on page 3-8</a> .
DS3i-N-12	Provides 12 DS-3 ports and supports 1:0, 1:1, and 1:N protection. It operates in Slots 1 to 5 and Slots 13 to 17.	See the <a href="#">“3.5 DS3i-N-12 Card” section on page 3-10</a> .
STM1E-12	Provides 12 electrical STM-1 ports and supports 1:1 protection. It operates in Slots 1 to 4 and Slots 14 to 17.	See the <a href="#">“3.6 STM1E-12 Card” section on page 3-13</a> .
BLANK	Assures fulfillment of EMC requirements in case of empty interface card slots.	See the <a href="#">“3.7 BLANK Card” section on page 3-14</a> .
FMEC-E1	Provides electrical connection into the system for 14 pairs of 75-ohm 1.0/2.3 miniature coax connectors for unbalanced E-1 ports from the E1-N-14 card.	See the <a href="#">“3.8 FMEC-E1 Card” section on page 3-15</a> .
FMEC-DS1/E1	Provides electrical connection into the system for 14 pairs of 120-ohm balanced E-1 ports from the E1-N-14 card. It uses high-density 37-pin DB connectors.	See the <a href="#">“3.9 FMEC-DS1/E1 Card” section on page 3-16</a> .
FMEC E1-120NP	Provides electrical connection into the system for 42 pairs of 120-ohm balanced E-1 ports from the E1-42 card. It uses Molex 96-pin LFH connectors.	See the <a href="#">“3.10 FMEC E1-120NP Card” section on page 3-18</a> .

**Table 3-1 Electrical Cards (continued)**

<b>Card</b>	<b>Description</b>	<b>For Additional Information...</b>
FMEC E1-120PROA	Provides electrical connection into the system for 42 pairs of 120-ohm balanced E-1 ports from the E1-42 card. It is for 1:3 protection from the A side (left side of the shelf). It occupies four slots, Slots 18 to 21. It uses Molex 96-pin LFH connectors.	See the “ <a href="#">3.11 FMEC E1-120PROA Card</a> ” section on page 3-21.
FMEC E1-120PROB	Provides electrical connection into the system for 42 pairs of 120-ohm balanced E-1 ports from the E1-42 card. It is for 1:3 protection from the B side (right side of the shelf). It occupies four slots, Slots 26 to 29. It uses Molex 96-pin LFH connectors.	See the “ <a href="#">3.12 FMEC E1-120PROB Card</a> ” section on page 3-23.
E1-75/120	Installed in the rack to provide a balanced 120-ohm connection for 42 E-1 interfaces that have a 75-ohm unbalanced connection. It uses Molex 96-pin LFH connectors and 1.0/2.3 miniature coax connectors.	See the “ <a href="#">3.13 E1-75/120 Impedance Conversion Panel</a> ” section on page 3-26.
FMEC-E3/DS3	Provides electrical connection into the system for 12 pairs of 75-ohm 1.0/2.3 miniature coax connectors for unbalanced E-3 or DS-3 ports.	See the “ <a href="#">3.14 FMEC-E3/DS3 Card</a> ” section on page 3-28.
FMEC STM1E 1:1	Provides electrical connection into the system for 2 x 12 pairs of 75-ohm 1.0/2.3 miniature coax connectors for unbalanced electrical STM-1 ports from two STM1E-12 cards in case of 1:1 protected operation. The FMEC STM1E 1:1 card is two slots wide and is recognized in Slots 18–19, 20–21, 26–27, and 28–29.	See the “ <a href="#">3.15 FMEC STM1E 1:1 Card</a> ” section on page 3-29.
FMEC-BLANK	Assures fulfillment of EMC requirements in case of empty FMEC slots.	See the “ <a href="#">3.16 FMEC-BLANK Card</a> ” section on page 3-29.
MIC-A/P	Provides connection for one of the two redundant inputs of system power and system connection for input and output alarms.	See the “ <a href="#">3.17 MIC-A/P FMEC</a> ” section on page 3-30.
MIC-C/T/P	Provides connection for one of the two redundant inputs of system power and system connection for LAN ports and system timing input/output.	See the “ <a href="#">3.18 MIC-C/T/P FMEC</a> ” section on page 3-33.

## 3.1.2 Card Compatibility

Table 3-2 lists the CTC software compatibility for each electrical card. See Table 2-4 on page 2-3 for a list of cross-connect cards that are compatible with each electrical card.

**Table 3-2 Electrical Card Software Release Compatibility**

Electrical Card	R3.3	R3.4	R4.0	R4.1	R4.5	R4.6	R4.7	R5.0
E1-N-14	Yes	Yes	Yes	Yes	—	Yes	—	Yes
E1-42	—	—	Yes	—	—	Yes	—	Yes
E3-12	Yes	Yes	Yes	Yes	—	Yes	—	Yes
DS3i-N-12	Yes	Yes	Yes	Yes (4.1.2)	—	Yes	—	Yes
STM1E-12	—	—	—	—	—	—	—	Yes

## 3.2 E1-N-14 Card

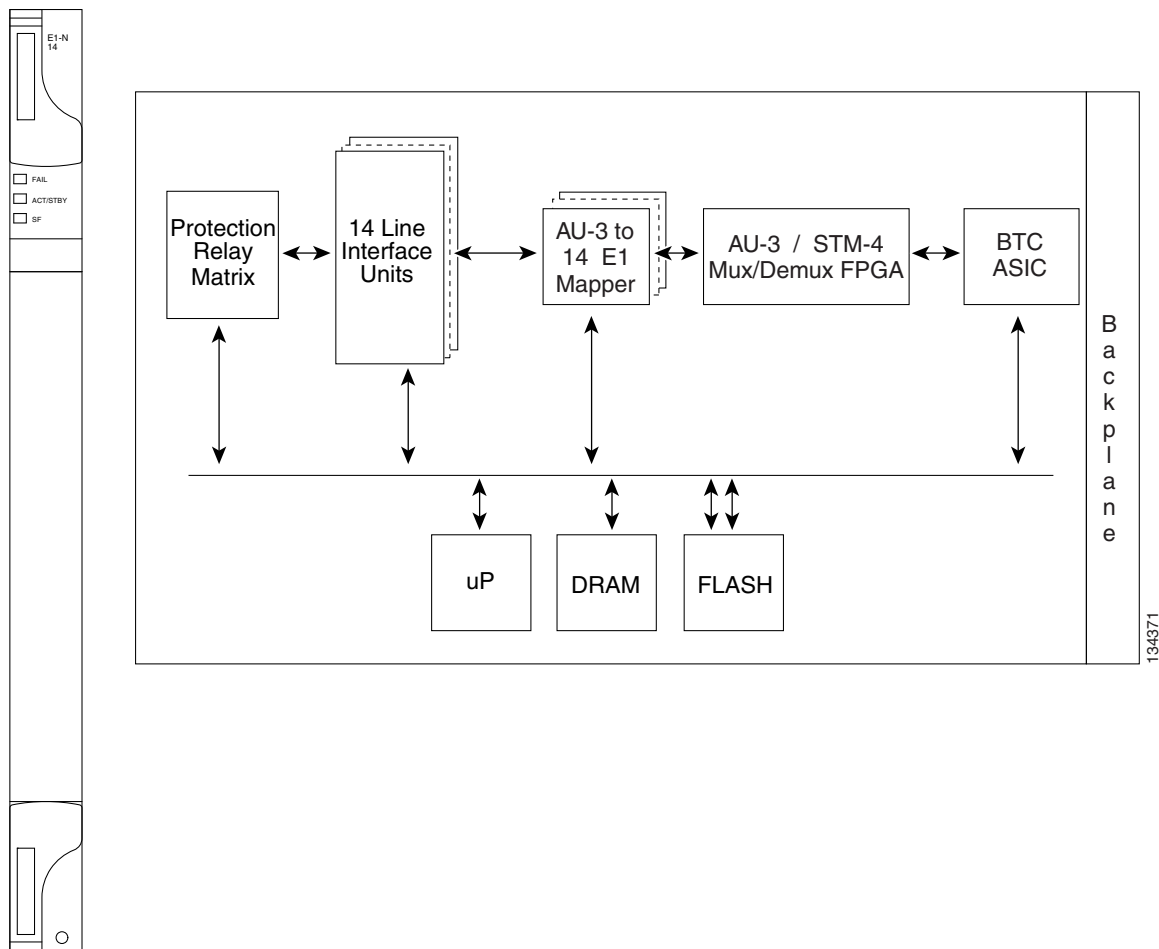
The 14-port ONS 15454 SDH E1-N-14 card provides 14 ITU-compliant, G.703 E-1 ports. Each port of the E1-N-14 card operates at 2.048 Mbps over a 120-ohm, twisted-pair copper cable (with FMEC-E1) or over a 75-ohm unbalanced coaxial cable (with FMEC-E1). Figure 3-1 shows the E1-N-14 faceplate and block diagram.



### Caution

This interface can only be connected to Safety Extreme Low Voltage (SELV) circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

Figure 3-1 E1-N-14 Faceplate and Block Diagram



## 3.2.1 E1-N-14 Card Functionality

Each E1-N-14 port features ITU-T G.703 compliant outputs and inputs supporting cable losses of up to 6 dB at 1024 kHz. The E1-N-14 card supports 1:N ( $N \leq 4$ ) protection. You can also provision the E1-N-14 card to monitor line and frame errors in both directions.

The E1-N-14 card can function as a working or protect card in 1:1 or 1:N protection schemes. If you use the E1-N-14 card as a standard E-1 card in a 1:1 protection group, you can install the E1-N-14 card in Slots 1 to 6 and 12 to 17 on the ONS 15454 SDH. If you use the card's 1:N functionality, you must install an E1-N-14 card in Slot 3 (for bank A) or Slot 15 (for bank B).

You can group and map E1-N-14 card traffic in VC-12 as per ITU-T G.707 to any other card in an ONS 15454 SDH node. For performance-monitoring purposes, you can gather bidirectional E-1 frame-level information (for example, loss of frame, parity errors, or cyclic redundancy check [CRC] errors).

**Note**

The lowest level cross-connect with the XC10G card is STM-1. Lower level signals, such as E-1, DS-3, or E-3, can be dropped. This might leave part of the bandwidth unused. The lowest level cross-connect with the XC-VXL-10G card and with the XC-VXL-2.5G card is VC-12 (2.048 Mbps).

## 3.2.2 E1-N-14 Card-Level Indicators

Table 3-3 describes the three E1-N-14 card faceplate LEDs.

**Table 3-3** E1-N-14 Card-Level Indicators

Card-Level LEDs	Description
Red FAIL LED	Indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the FAIL LED persists in flashing.
ACT/STBY LED Green (Active) Amber (Standby)	Indicates that the E1-N-14 card is operational and ready to carry traffic (green) or that the card is in Standby mode (amber).
Amber SF LED	Indicates a signal failure or condition such as loss of signal (LOS), loss of frame (LOF), or high BERs on one or more of the card's ports.

## 3.2.3 E1-N-14 Port-Level Indicators

You can obtain the status of the 14 E-1 ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 3.3 E1-42 Card

The 42-port ONS 15454 SDH E1-42 card provides 42 ITU-compliant, G.703 E-1 ports. Each port of the E1-42 card operates at 2.048 Mbps over a 120-ohm, twisted-pair copper cable. Front mount electrical connection is done using the FMEC E1-120 NP card for unprotected operation, the FMEC E1-120PROA for 1:3 protection in the left side of the shelf, or the FMEC E1-120PROB for 1:3 protection in the right side of the shelf.

**Caution**

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

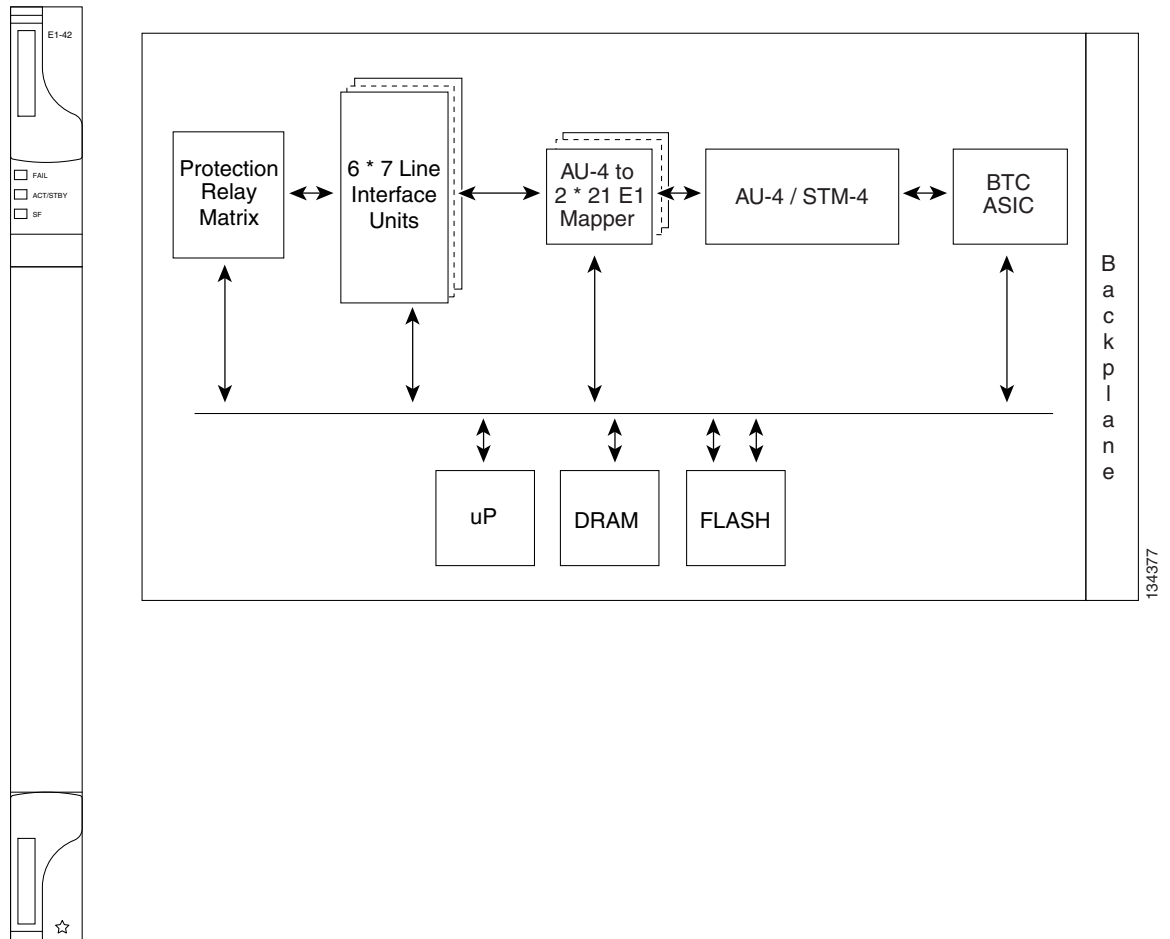
**Note**

If you need 75-ohm unbalanced interfaces, you must additionally use the E1-75/120 conversion panel.

Figure 3-2 shows the E1-42 card faceplate and block diagram.



Figure 3-2 E1-42 Faceplate and Block Diagram



### 3.3.1 E1-42 Card Functionality

Each E1-42 port features ITU-T G.703 compliant outputs and inputs supporting cable losses of up to 6 dB at 1024 kHz. The E1-42 card supports 1:3 protection. You can also provision the E1-42 card to monitor line and frame errors in both directions.

The E1-42 card can function as a working or protect card in 1:3 protection schemes. If you use the E1-42 card as a standard E-1 card, you can install the E1-42 card in Slots 1 to 4 and 14 to 17 on the ONS 15454 SDH. If you use the card's 1:3 functionality, you must install an E1-42 card as the protect card in Slot 3 (for bank A) or in Slot 15 (for bank B).

You can group and map E1-42 card traffic in VC-12 as per ITU-T G.707 to any other card in an ONS 15454 SDH node. For performance-monitoring purposes, you can gather bidirectional E-1 frame-level information (for example, loss of frame, parity errors, or CRC errors).



#### Note

The lowest level cross-connect with the XC10G card is STM-1. Lower level signals, such as E-1, DS-3, or E-3, can be dropped. This might leave part of the bandwidth unused. The lowest level cross-connect with the XC-VXL-10G card and the XC-VXL-2.5G card is VC-12 (2.048 Mbps).

## 3.3.2 E1-42 Card-Level Indicators

Table 3-4 describes the three LEDs on the E1-42 card faceplate.

**Table 3-4** E1-42 Card-Level Indicators

Card-Level LEDs	Description
Red FAIL LED	Indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the FAIL LED persists in flashing.
ACT/STBY LED Green (Active) Amber (Standby)	Indicates that the E1-42 card is operational and ready to carry traffic (green) or that the card is in Standby mode (amber).
Amber SF LED	Indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports.

## 3.3.3 E1-42 Port-Level Indicators

You can obtain the status of the 42 E-1 ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 3.4 E3-12 Card

The 12-port ONS 15454 SDH E3-12 card provides 12 ITU-compliant, G.703 E-3 ports per card. Each interface operates at 34.368 Mbps over a 75-ohm coaxial cable (with the FMEC-E3/DS3 card). The E3-12 card operates as a working or protect card in 1:1 protection schemes.



### Caution

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

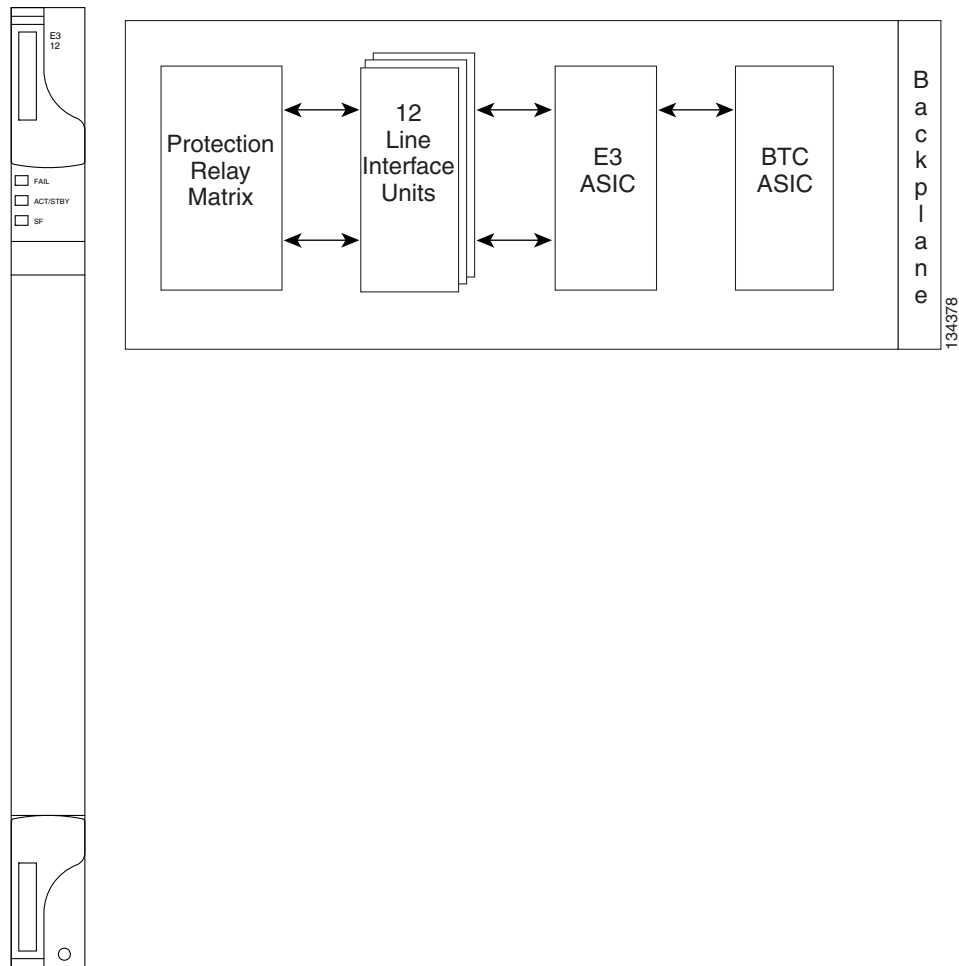


### Note

The E3-12 card can be deployed in a central office or a carrier's exchange.

Figure 3-3 shows the E3-12 card faceplate and block diagram.

**Figure 3-3 E3-12 Card Faceplate and Block Diagram**



## 3.4.1 E3-12 Card Functionality

You can install the E3-12 card in Slots 1 to 5 and 14 to 17 on the ONS 15454 SDH. Each E3-12 port features ITU-T G.703 compliant outputs supporting cable losses of up to 12 dB at 17184 kHz. The E3-12 card supports 1:1 protection.



**Note**

The lowest level cross-connect with the XC10G card is STM-1. Lower level signals, such as E-1, DS-3, or E-3, can be dropped. This might leave part of the bandwidth unused. The lowest level cross-connect with the XC-VXL-10G card and the XC-VXL-2.5G card is VC-12 (2.048 Mbps).



**Note**

When a protection switch moves traffic from the E3-12 working/active card to the E3-12 protect/standby card, ports on the now active/standby card cannot be taken out of service. Lost traffic can result if you take a port out of service, even if the E3-12 active/standby card no longer carries traffic.

## 3.4.2 E3-12 Card-Level Indicators

Table 3-5 describes the three LEDs on the E3-12 card faceplate.

**Table 3-5** E3-12 Card-Level Indicators

Card-Level LEDs	Description
Red FAIL LED	Indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the FAIL LED persists in flashing.
ACT/STBY LED Green (Active) Amber (Standby)	When the ACT/STBY LED is green, the E3-12 card is operational and ready to carry traffic. When the ACT/STBY LED is amber, the E3-12 card is operational and in Standby (protect) mode.
Amber SF LED	Indicates a signal failure or condition such as port LOS.

## 3.4.3 E3-12 Port-Level Indicators

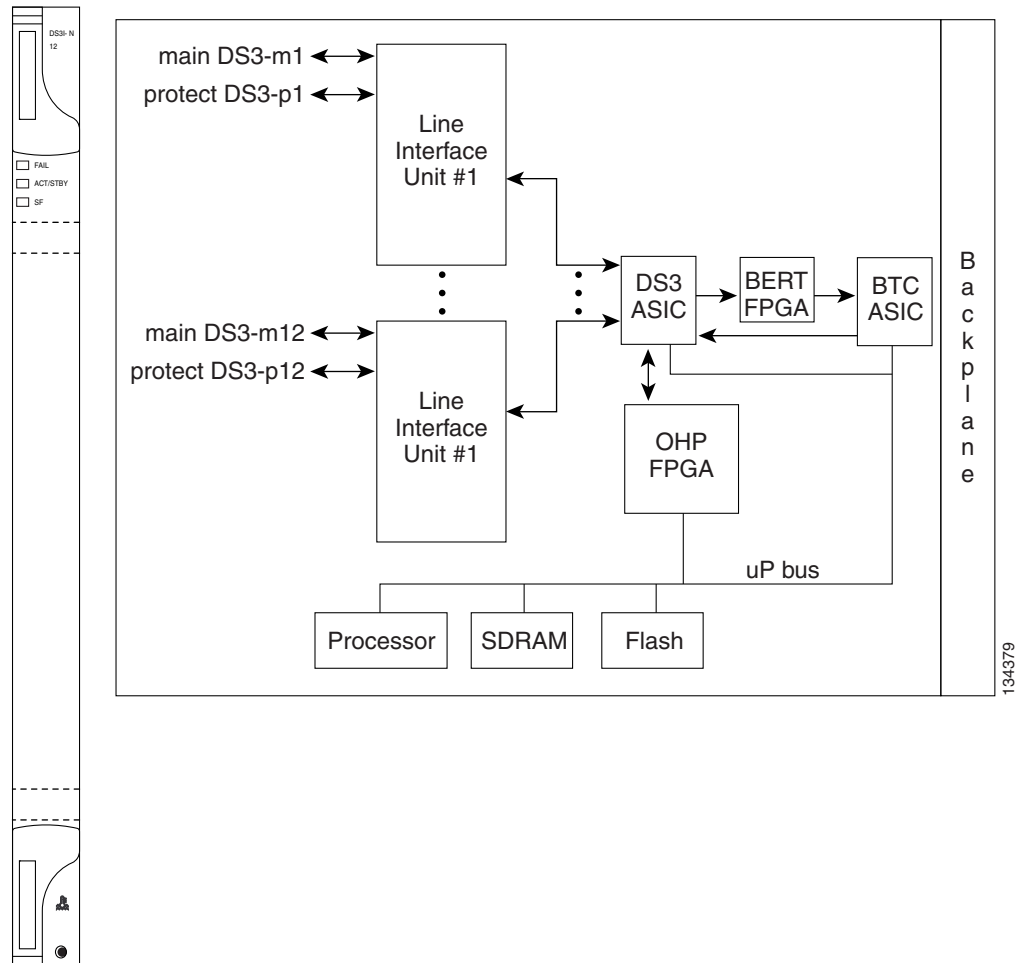
You can find the status of the twelve E3-12 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 3.5 DS3i-N-12 Card

The 12-port ONS 15454 SDH DS3i-N-12 card provides 12 ITU-T G.703, ITU-T G.704, and Telcordia GR-499-CORE compliant DS-3 ports per card. Each port operates at 44.736 Mbps over a 75-ohm coaxial cable (with the FMEC-E3/DS3 card). The DS3i-N-12 can operate as the protect card in a 1:N (N <= 4) DS-3 protection group. It has circuitry that allows it to protect up to four working DS3i-N-12 cards. In a 1:N protection group the DS3i-N-12 card must reside in either the Slot 3 or 15.

Figure 3-4 shows the DS3i-N-12 faceplate and block diagram.

**Figure 3-4 DS3i-N-12 Faceplate and Block Diagram**



## 3.5.1 DS3i-N-12 Card Functionality

The DS3i-N-12 can detect several different errored logic bits within a DS-3 frame. This function lets the ONS 15454 SDH identify a degrading DS-3 facility caused by upstream electronics (DS-3 Framer). In addition, DS-3 frame format autodetection and J1 path trace are supported. By monitoring additional overhead in the DS-3 frame, subtle network degradations can be detected.

The DS3i-n-12 can also aggregate DS3 and E1 traffic and transport it between SONET and SDH networks through AU4/STS 3 trunks, with the ability to add and drop DS3s to an STS3 trunk at intermediate nodes.

The following list summarizes the DS3i-N-12 card features:

- Provisionable framing format (M23, C-bit, or unframed)
- Autorecognition and provisioning of incoming framing
- VC-3 payload mapping as per ITU-T G.707
- Idle signal (“1100”) monitoring as per Telcordia GR-499-CORE
- P-bit monitoring

- C-bit parity monitoring
- X-bit monitoring
- M-bit monitoring
- F-bit monitoring
- Far-end block error (FEBE) monitoring
- Far-end alarm and control (FEAC) status and loop code detection
- Path trace byte support with TIM-P alarm generation

You can install the DS3i-N-12 card in Slots 1 to 5 and 13 to 17. Each DS3i-N-12 port features DS-N-level outputs supporting distances up to 137 m (450 feet). With FMEC-E3/DS3, the card supports 1.0/2.3 miniature coax nonbalanced connectors.

**Note**

The lowest level cross-connect with the XC10G card is STM-1. Lower level signals, such as E-1, DS-3, or E-3, can be dropped. This might leave part of the bandwidth unused. The lowest level cross-connect with the XC-VXL-10G card and the XC-VXL-2.5G card is VC-12 (2.048 Mbps).

## 3.5.2 DS3i-N-12 Card-Level Indicators

Table 3-6 describes the three LEDs on the DS3i-N-12 card faceplate.

**Table 3-6** DS3i-N-12 Card-Level Indicators

Card-Level LEDs	Description
Red FAIL LED	Indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists in flashing.
ACT/STBY LED Green (Active) Amber (Standby)	When the ACT/STBY LED is green, the DS3i-N-12 card is operational and ready to carry traffic. When the ACT/STBY LED is amber, the DS3i-N-12 card is operational and in Standby (protect) mode.
Amber SF LED	Indicates a signal failure or condition such as LOS or LOF on one or more of the card's ports.

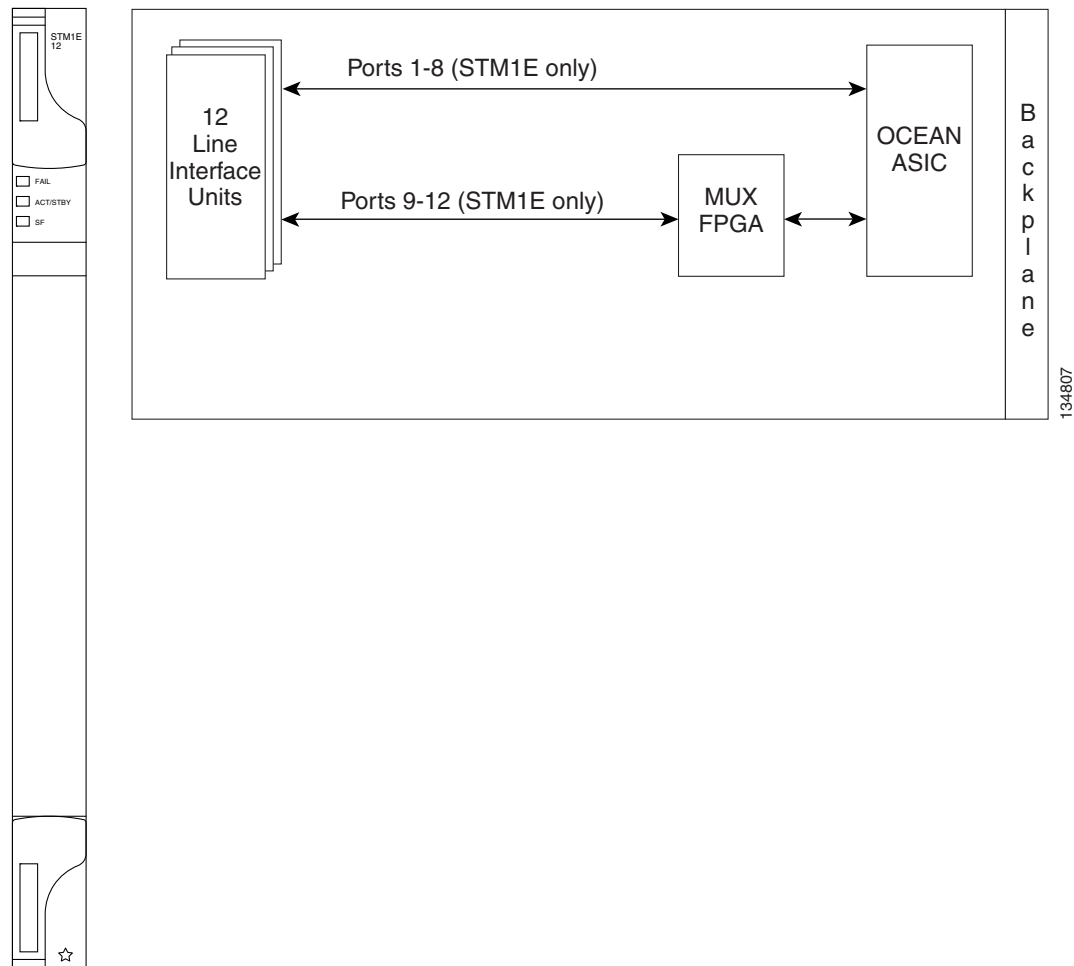
## 3.5.3 DS3i-N-12 Port-Level Indicators

You can find the status of the DS3i-N-12 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 3.6 STM1E-12 Card

The 12-port ONS 15454 SDH STM1E-12 card provides 12 ITU-compliant, G.703 STM-1 ports per card. Ports 9 to 12 can each be either E-4 or STM-1. Each interface operates at 155.52 Mbps for STM-1 or 139.264 Mbps for E-4 over a 75-ohm coaxial cable (with the FMEC STM1E 1:1 card). In E-4 mode, framed or unframed signal operation is possible. The STM1E-12 card operates as a working or protect card in 1:1 protection schemes. Figure 3-5 shows the STM1E-12 faceplate and block diagram.

**Figure 3-5** STM1E-12 Faceplate and Block Diagram



### 3.6.1 STM 1E-12 Card Functionality

You can install the STM1E-12 card in Slots 1 to 4 and 14 to 17 on the ONS 15454 SDH. Each STM1E-12 port features ITU-T G.703 compliant outputs supporting cable losses of up to 12.7 dB at 78 MHz. The STM1E-12 card supports non-protection and 1:1 protection. In both cases, the FMEC STM1E 1:1 card is used. Up to two non-protected active STM1E cards use the same FMEC STM1E 1:1 card, and one active plus one protect STM1E cards use the same FMEC STM1E 1:1 card.

**Note**

When a protection switch moves traffic from the STM1E-12 working/active card to the STM1E-12 protect/standby card, ports on the now active/standby card cannot be taken out of service. Lost traffic can result if you take a port out of service, even if the STM1E-12 active/standby card no longer carries traffic.

**Note**

Use an external clock when doing service disruption time measurements on the STM1E-12.

## 3.6.2 STM1E-12 Card-Level Indicators

Table 3-7 describes the three LEDs on the STM1E-12 card faceplate.

**Table 3-7** STM1E-12 Card-Level Indicators

Card-Level LEDs	Description
Red FAIL LED	Indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the FAIL LED persists in flashing.
ACT/STBY LED Green (Active) Amber (Standby)	When the ACT/STBY LED is green, the STM1E-12 card is operational and ready to carry traffic. When the ACT/STBY LED is amber, the STM1E-12 card is operational and in Standby (protect) mode.
Amber SF LED	Indicates a signal failure or condition such as port LOS.

## 3.6.3 STM1E-12 Port-Level Indicators

You can find the status of the 12 STM1E-12 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 3.7 BLANK Card

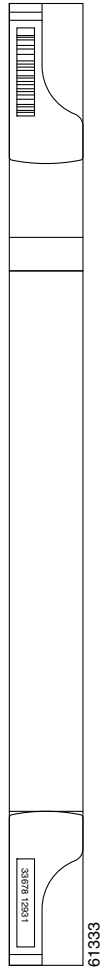
The BLANK card provides EMC emission control for empty interface card slots. It also provides a way to close off the subrack front area, thus allowing air flow and convection to be maintained through the subrack. Figure 3-6 shows the BLANK card faceplate.

**Caution**

You must install the BLANK card in every empty interface card slot to maintain EMC requirements of the system and proper air flow.



**Figure 3-6** FILLER Faceplate



## 3.8 FMEC-E1 Card

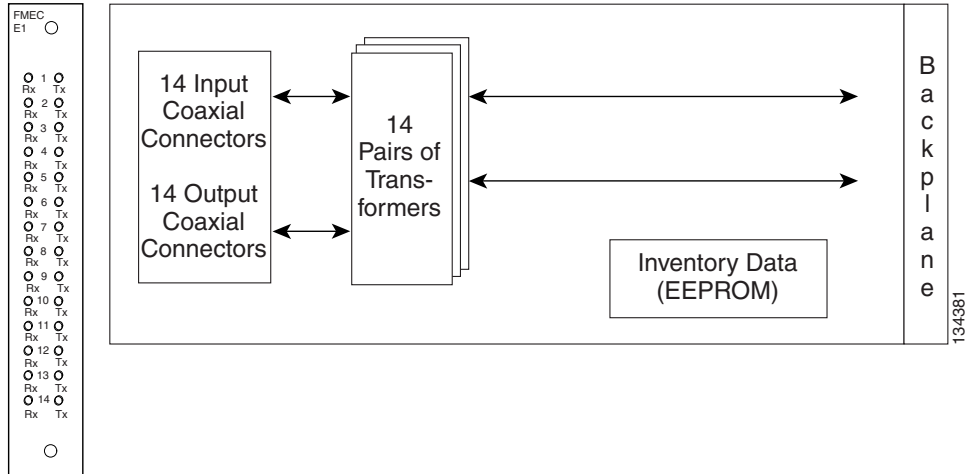
The ONS 15454 SDH FMEC-E1 card provides front mount electrical connection for 14 ITU-compliant, G.703 E-1 ports. With the FMEC-E1 card, each E1-N-14 port operates at 2.048 Mbps over a 75-ohm unbalanced coaxial 1.0/2.3 miniature coax connector. [Figure 3-7](#) shows the FMEC-E1 card faceplate and block diagram.



**Caution**

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

**Figure 3-7 FMEC-E1 Faceplate and Block Diagram**



You can install the FMEC-E1 card in any Electrical Facility Connection Assembly (EFCA) slot from Slot 18 to 22 or Slot 25 to 29 on the ONS 15454 SDH. Each FMEC-E1 card port features E1-level inputs and outputs supporting cable losses of up to 6 dB at 1024 kHz.

## 3.9 FMEC-DS1/E1 Card

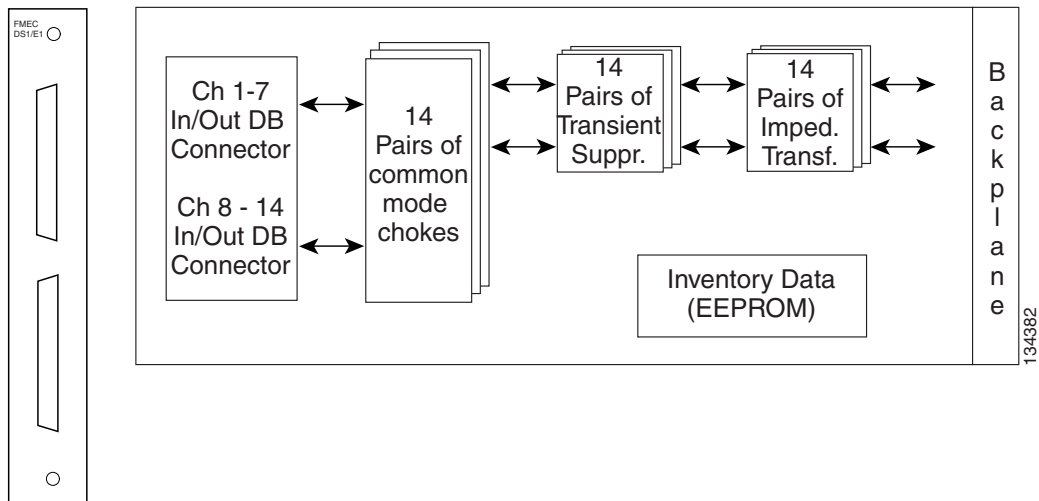
The ONS 15454 SDH FMEC-DS1/E1 card provides front mount electrical connection for 14 ITU-compliant, G.703 E-1 ports. With the FMEC-DS1/E1 card, each E1-N-14 port operates at 2.048 Mbps over a 120-ohm balanced cable via two 37-pin DB connectors. [Figure 3-8](#) shows the FMEC-DS1/E1 card faceplate and block diagram.



**Caution**

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

**Figure 3-8 FMEC-DS1/E1 Faceplate and Block Diagram**



You can install the FMEC-DS1/E1 card in any EFCA slot from Slot 18 to 22 or Slot 25 to 29 on the ONS 15454 SDH. Each FMEC-DS1/E1 card interface features E1-level inputs and outputs supporting cable losses of up to 6 dB at 1024 kHz.

## 3.9.1 FMEC-DS1/E1 Card Connector Pinout

Use [Table 3-8](#) to make the connection from the E-1 37-pin DB connector for Ports 1 to 7 to the external balanced 120-ohm E-1 interfaces.

**Table 3-8** E-1 Interface Pinouts on Ports 1 to 7

Pin No.	Signal Name	Pin No.	Signal Name
1	GND	20	RX 7 P
2	TX 7 P	21	RX 7 N
3	TX 7 N	22	GND
4	TX 6 P	23	RX 6 P
5	TX 6 N	24	RX 6 N
6	GND	25	RX 5 P
7	TX 5 P	26	RX 5 N
8	TX 5 N	27	GND
9	TX 4 P	28	RX 4 P
10	TX 4 N	29	RX 4 N
11	GND	30	RX 3 P
12	TX 3 P	31	RX 3 N
13	TX 3 N	32	GND
14	TX 2 P	33	RX 2 P
15	TX 2 N	34	RX 2 N
16	GND	35	RX 1 P
17	TX 1 P	36	RX 1 N
18	TX 1 N	37	GND
19	GND	—	—

Use [Table 3-9](#) to make the connection from the E-1 37-pin DB connector for Ports 8 to 14 to the external balanced 120-ohm E-1 interfaces.

**Table 3-9** E-1 Interface Pinouts on Ports 8 to 14

Pin No.	Signal Name	Pin No.	Signal Name
1	GND	20	RX 14 P
2	TX 14 P	21	RX 14 N
3	TX 14 N	22	GND
4	TX 13 P	23	RX 13 P

**Table 3-9** E-1 Interface Pinouts on Ports 8 to 14 (continued)

Pin No.	Signal Name	Pin No.	Signal Name
5	TX 13 N	24	RX 13 N
6	GND	25	RX 12 P
7	TX 12 P	26	RX 12 N
8	TX 12 N	27	GND
9	TX 11 P	28	RX 11 P
10	TX 11 N	29	RX 11 N
11	GND	30	RX 10 P
12	TX 10 P	31	RX 10 N
13	TX 10 N	32	GND
14	TX 9 P	33	RX 9 P
15	TX 9 N	34	RX 9 N
16	GND	35	RX 8 P
17	TX 8 P	36	RX 8 N
18	TX 8 N	37	GND
19	GND	—	—

## 3.10 FMEC E1-120NP Card

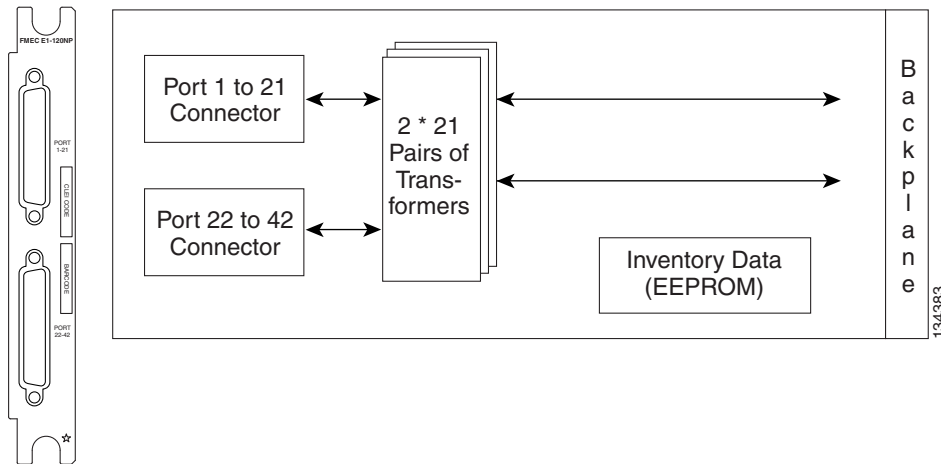
The ONS 15454 SDH FMEC E1-120NP card provides front mount electrical connection for 42 ITU-compliant, G.703 E-1 ports. With the FMEC E1-120NP card, each E1-42 port operates at 2.048 Mbps over a 120-ohm balanced interface. Twenty-one interfaces are led through one common Molex 96-pin LFH connector. [Figure 3-9](#) shows the FMEC E1-120NP faceplate and block diagram.



### Caution

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

Figure 3-9 FMEC E1-120NP Faceplate and Block Diagram



You can install the FMEC E1-120NP card in any EFCA slot from Slot 18 to 22 or Slot 25 to 29 on the ONS 15454 SDH. Each FMEC E1-120NP card port features E1-level inputs and outputs supporting cable losses of up to 6 dB at 1024 kHz.

### 3.10.1 FMEC E1-120NP Connector Pinout

Use [Table 3-10](#) to make the connection from the E-1 96-pin connector for Ports 1 to 21 to the external balanced 120-ohm E-1 interfaces.

Table 3-10 E-1 Interface Pinouts on Ports 1 to 21

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	TX 11 N	25	RX 11 N	49	TX 21 N	73	RX 21 N
2	TX 11 P	26	RX 11 P	50	TX 21 P	74	RX 21 P
3	TX 10 N	27	RX 10 N	51	TX 20 N	75	RX 20 N
4	TX 10 P	28	RX 10 P	52	TX 20 P	76	RX 20 P
5	TX 9 N	29	RX 9 N	53	TX 19 N	77	RX 19 N
6	TX 9 P	30	RX 9 P	54	TX 19 P	78	RX 19 P
7	TX 8 N	31	RX 8 N	55	TX 18 N	79	RX 18 N
8	TX 8 P	32	RX 8 P	56	TX 18 P	80	RX 18 P
9	TX 7 N	33	RX 7 N	57	TX 17 N	81	RX 17 N
10	TX 7 P	34	RX 7 P	58	TX 17 P	82	RX 17 P
11	TX 6 N	35	RX 6 N	59	TX 16 N	83	RX 16 N
12	TX 6 P	36	RX 6 P	60	TX 16 P	84	RX 16 P
13	TX 5 N	37	RX 5 N	61	TX 15 N	85	RX 15 N
14	TX 5 P	38	RX 5 P	62	TX 15 P	86	RX 15 P
15	TX 4 N	39	RX 4 N	63	TX 14 N	87	RX 14 N

**Table 3-10** E-1 Interface Pinouts on Ports 1 to 21 (continued)

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
16	TX 4 P	40	RX 4 P	64	TX 14 P	88	RX 14 P
17	TX 3 N	41	RX 3 N	65	TX 13 N	89	RX 13 N
18	TX 3 P	42	RX 3 P	66	TX 13 P	90	RX 13 P
19	TX 2 N	43	RX 2 N	67	TX 12 N	91	RX 12 N
20	TX 2 P	44	RX 2 P	68	TX 12 P	92	RX 12 P
21	TX 1 N	45	RX 1 N	69	NC	93	NC
22	TX 1 P	46	RX 1 P	70	NC	94	NC
23	NC	47	NC	71	NC	95	NC
24	NC	48	NC	72	NC	96	NC

Use [Table 3-11](#) to make the connection from the E-1 96-pin connector for Ports 22 to 42 to the external balanced 120-ohm E-1 interfaces.

**Table 3-11** E-1 Interface Pinouts on Ports 22 to 42

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	TX 32 N	25	RX 32 N	49	TX 42 N	73	RX 42 N
2	TX 32 P	26	RX 32 P	50	TX 42 P	74	RX 42 P
3	TX 31 N	27	RX 31 N	51	TX 41 N	75	RX 41 N
4	TX 31 P	28	RX 31 P	52	TX 41 P	76	RX 41 P
5	TX 30 N	29	RX 30 N	53	TX 40 N	77	RX 40 N
6	TX 30 P	30	RX 30 P	54	TX 40 P	78	RX 40 P
7	TX 29 N	31	RX 29 N	55	TX 39 N	79	RX 39 N
8	TX 29 P	32	RX 29 P	56	TX 39 P	80	RX 39 P
9	TX 28 N	33	RX 28 N	57	TX 38 N	81	RX 38 N
10	TX 28 P	34	RX 28 P	58	TX 38 P	82	RX 38 P
11	TX 27 N	35	RX 27 N	59	TX 37 N	83	RX 37 N
12	TX 27 P	36	RX 27 P	60	TX 37 P	84	RX 37 P
13	TX 26 N	37	RX 26 N	61	TX 36 N	85	RX 36 N
14	TX 26 P	38	RX 26 P	62	TX 36 P	86	RX 36 P
15	TX 25 N	39	RX 25 N	63	TX 35 N	87	RX 35 N
16	TX 25 P	40	RX 25 P	64	TX 35 P	88	RX 35 P
17	TX 24 N	41	RX 24 N	65	TX 34 N	89	RX 34 N
18	TX 24 P	42	RX 24 P	66	TX 34 P	90	RX 34 P
19	TX 23 N	43	RX 23 N	67	TX 33 N	91	RX 33 N
20	TX 23 P	44	RX 23 P	68	TX 33 P	92	RX 33 P

Table 3-11 E-1 Interface Pinouts on Ports 22 to 42 (continued)

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
21	TX 22 N	45	RX 22 N	69	NC	93	NC
22	TX 22 P	46	RX 22 P	70	NC	94	NC
23	NC	47	NC	71	NC	95	NC
24	NC	48	NC	72	NC	96	NC

## 3.11 FMEC E1-120PROA Card

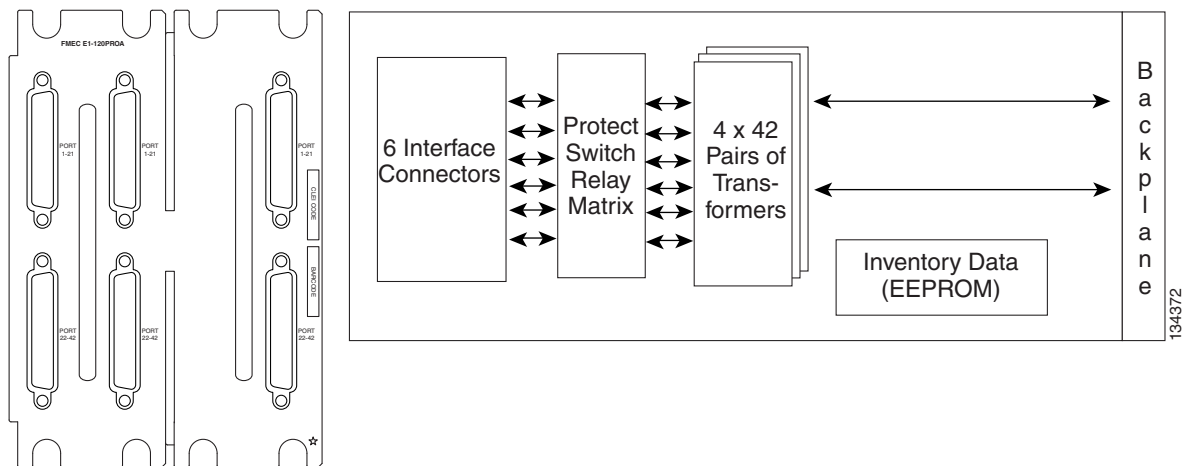
The ONS 15454 SDH FMEC E1-120PROA card provides front mount electrical connection for 126 ITU compliant, G.703 E-1 ports. With the FMEC E1-120PROA card, each E1-42 port operates at 2.048 Mbps over a 120-ohm balanced interface. Each Molex 96-pin LFH connector supports 21 E1 interfaces. [Figure 3-10](#) shows the FMEC E1-120PROA faceplate and block diagram.



### Caution

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

Figure 3-10 FMEC E1-120PROA Faceplate and Block Diagram



You can install the FMEC E1-120PROA card in the EFCA in the four far-left slots (Slots 18 to 21) on the ONS 15454 SDH. Each FMEC E1-120PROA card port features E1-level inputs and outputs supporting cable losses of up to 6 dB at 1024 kHz.

### 3.11.1 FMEC E1-120PROA Connector Pinout

Use [Table 3-12](#) to make the connection from the E-1 96-pin connector for Ports 1 to 21 to the external balanced 120-ohm E-1 interfaces.

**Table 3-12** E-1 Interface Pinouts on Ports 1 to 21

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	TX 11 N	25	RX 11 N	49	TX 21 N	73	RX 21 N
2	TX 11 P	26	RX 11 P	50	TX 21 P	74	RX 21 P
3	TX 10 N	27	RX 10 N	51	TX 20 N	75	RX 20 N
4	TX 10 P	28	RX 10 P	52	TX 20 P	76	RX 20 P
5	TX 9 N	29	RX 9 N	53	TX 19 N	77	RX 19 N
6	TX 9 P	30	RX 9 P	54	TX 19 P	78	RX 19 P
7	TX 8 N	31	RX 8 N	55	TX 18 N	79	RX 18 N
8	TX 8 P	32	RX 8 P	56	TX 18 P	80	RX 18 P
9	TX 7 N	33	RX 7 N	57	TX 17 N	81	RX 17 N
10	TX 7 P	34	RX 7 P	58	TX 17 P	82	RX 17 P
11	TX 6 N	35	RX 6 N	59	TX 16 N	83	RX 16 N
12	TX 6 P	36	RX 6 P	60	TX 16 P	84	RX 16 P
13	TX 5 N	37	RX 5 N	61	TX 15 N	85	RX 15 N
14	TX 5 P	38	RX 5 P	62	TX 15 P	86	RX 15 P
15	TX 4 N	39	RX 4 N	63	TX 14 N	87	RX 14 N
16	TX 4 P	40	RX 4 P	64	TX 14 P	88	RX 14 P
17	TX 3 N	41	RX 3 N	65	TX 13 N	89	RX 13 N
18	TX 3 P	42	RX 3 P	66	TX 13 P	90	RX 13 P
19	TX 2 N	43	RX 2 N	67	TX 12 N	91	RX 12 N
20	TX 2 P	44	RX 2 P	68	TX 12 P	92	RX 12 P
21	TX 1 N	45	RX 1 N	69	NC	93	NC
22	TX 1 P	46	RX 1 P	70	NC	94	NC
23	NC	47	NC	71	NC	95	NC
24	NC	48	NC	72	NC	96	NC

Use [Table 3-13](#) to make the connection from the E-1 96-pin connector for Ports 22 to 42 to the external balanced 120-ohm E-1 interfaces.

**Table 3-13** E-1 Interface Pinouts on Ports 22 to 42

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	TX 32 N	25	RX 32 N	49	TX 42 N	73	RX 42 N
2	TX 32 P	26	RX 32 P	50	TX 42 P	74	RX 42 P
3	TX 31 N	27	RX 31 N	51	TX 41 N	75	RX 41 N
4	TX 31 P	28	RX 31 P	52	TX 41 P	76	RX 41 P
5	TX 30 N	29	RX 30 N	53	TX 40 N	77	RX 40 N



**Table 3-13** E-1 Interface Pinouts on Ports 22 to 42 (continued)

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
6	TX 30 P	30	RX 30 P	54	TX 40 P	78	RX 40 P
7	TX 29 N	31	RX 29 N	55	TX 39 N	79	RX 39 N
8	TX 29 P	32	RX 29 P	56	TX 39 P	80	RX 39 P
9	TX 28 N	33	RX 28 N	57	TX 38 N	81	RX 38 N
10	TX 28 P	34	RX 28 P	58	TX 38 P	82	RX 38 P
11	TX 27 N	35	RX 27 N	59	TX 37 N	83	RX 37 N
12	TX 27 P	36	RX 27 P	60	TX 37 P	84	RX 37 P
13	TX 26 N	37	RX 26 N	61	TX 36 N	85	RX 36 N
14	TX 26 P	38	RX 26 P	62	TX 36 P	86	RX 36 P
15	TX 25 N	39	RX 25 N	63	TX 35 N	87	RX 35 N
16	TX 25 P	40	RX 25 P	64	TX 35 P	88	RX 35 P
17	TX 24 N	41	RX 24 N	65	TX 34 N	89	RX 34 N
18	TX 24 P	42	RX 24 P	66	TX 34 P	90	RX 34 P
19	TX 23 N	43	RX 23 N	67	TX 33 N	91	RX 33 N
20	TX 23 P	44	RX 23 P	68	TX 33 P	92	RX 33 P
21	TX 22 N	45	RX 22 N	69	NC	93	NC
22	TX 22 P	46	RX 22 P	70	NC	94	NC
23	NC	47	NC	71	NC	95	NC
24	NC	48	NC	72	NC	96	NC

## 3.12 FMEC E1-120PROB Card

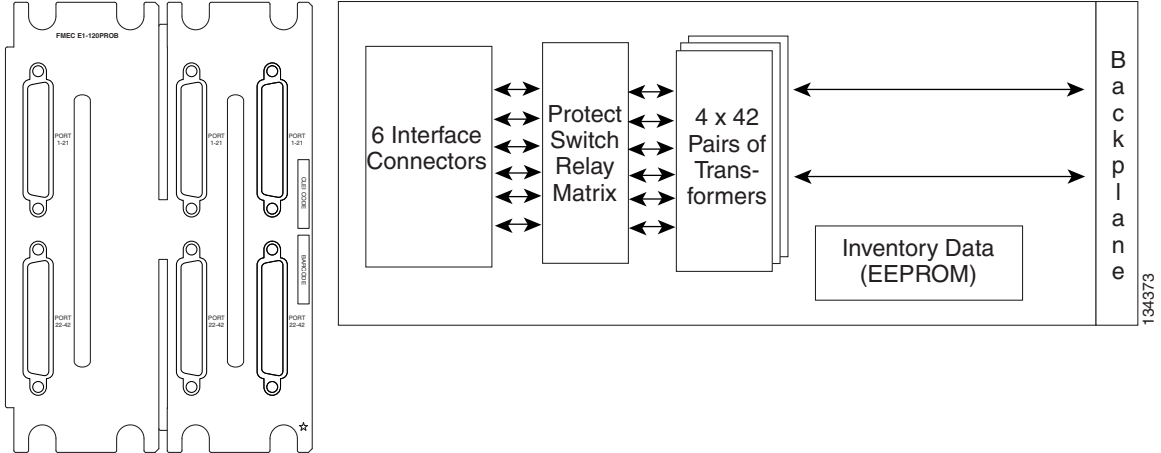
The ONS 15454 SDH FMEC E1-120PROB card provides front mount electrical connection for 126 ITU-compliant, G.703 E-1 ports. With the FMEC E1-120PROB card, each E1-42 port operates at 2.048 Mbps over a 120-ohm balanced interface. Each Molex 96-pin LFH connector supports 21 E-1 interfaces. [Figure 3-11](#) shows the FMEC E1-120PROB faceplate and block diagram.



### Caution

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

Figure 3-11 FMEC E1-120PROB Faceplate and Block Diagram



You can install the FMEC E1-120PROB card in EFCA Slots 26 to 29 on the ONS 15454 SDH. Each FMEC E1-120PROB card port features E-1-level inputs and outputs supporting cable losses of up to 6 dB at 1024 kHz.

## 3.12.1 FMEC E1-120PROB Connector Pinout

Use [Table 3-14](#) to make the connection from the E-1 96-pin connector for Ports 1 to 21 to the external balanced 120-ohm E-1 interfaces.

Table 3-14 E-1 Interface Pinouts on Ports 1 to 21

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	TX 11 N	25	RX 11 N	49	TX 21 N	73	RX 21 N
2	TX 11 P	26	RX 11 P	50	TX 21 P	74	RX 21 P
3	TX 10 N	27	RX 10 N	51	TX 20 N	75	RX 20 N
4	TX 10 P	28	RX 10 P	52	TX 20 P	76	RX 20 P
5	TX 9 N	29	RX 9 N	53	TX 19 N	77	RX 19 N
6	TX 9 P	30	RX 9 P	54	TX 19 P	78	RX 19 P
7	TX 8 N	31	RX 8 N	55	TX 18 N	79	RX 18 N
8	TX 8 P	32	RX 8 P	56	TX 18 P	80	RX 18 P
9	TX 7 N	33	RX 7 N	57	TX 17 N	81	RX 17 N
10	TX 7 P	34	RX 7 P	58	TX 17 P	82	RX 17 P
11	TX 6 N	35	RX 6 N	59	TX 16 N	83	RX 16 N
12	TX 6 P	36	RX 6 P	60	TX 16 P	84	RX 16 P
13	TX 5 N	37	RX 5 N	61	TX 15 N	85	RX 15 N
14	TX 5 P	38	RX 5 P	62	TX 15 P	86	RX 15 P
15	TX 4 N	39	RX 4 N	63	TX 14 N	87	RX 14 N

**Table 3-14 E-1 Interface Pinouts on Ports 1 to 21 (continued)**

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
16	TX 4 P	40	RX 4 P	64	TX 14 P	88	RX 14 P
17	TX 3 N	41	RX 3 N	65	TX 13 N	89	RX 13 N
18	TX 3 P	42	RX 3 P	66	TX 13 P	90	RX 13 P
19	TX 2 N	43	RX 2 N	67	TX 12 N	91	RX 12 N
20	TX 2 P	44	RX 2 P	68	TX 12 P	92	RX 12 P
21	TX 1 N	45	RX 1 N	69	NC	93	NC
22	TX 1 P	46	RX 1 P	70	NC	94	NC
23	NC	47	NC	71	NC	95	NC
24	NC	48	NC	72	NC	96	NC

Use [Table 3-15](#) to make the connection from the E-1 96-pin connector for Ports 22 to 42 to the external balanced 120-ohm E-1 interfaces.

**Table 3-15 E-1 Interface Pinouts on Ports 22 to 42**

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
1	TX 32 N	25	RX 32 N	49	TX 42 N	73	RX 42 N
2	TX 32 P	26	RX 32 P	50	TX 42 P	74	RX 42 P
3	TX 31 N	27	RX 31 N	51	TX 41 N	75	RX 41 N
4	TX 31 P	28	RX 31 P	52	TX 41 P	76	RX 41 P
5	TX 30 N	29	RX 30 N	53	TX 40 N	77	RX 40 N
6	TX 30 P	30	RX 30 P	54	TX 40 P	78	RX 40 P
7	TX 29 N	31	RX 29 N	55	TX 39 N	79	RX 39 N
8	TX 29 P	32	RX 29 P	56	TX 39 P	80	RX 39 P
9	TX 28 N	33	RX 28 N	57	TX 38 N	81	RX 38 N
10	TX 28 P	34	RX 28 P	58	TX 38 P	82	RX 38 P
11	TX 27 N	35	RX 27 N	59	TX 37 N	83	RX 37 N
12	TX 27 P	36	RX 27 P	60	TX 37 P	84	RX 37 P
13	TX 26 N	37	RX 26 N	61	TX 36 N	85	RX 36 N
14	TX 26 P	38	RX 26 P	62	TX 36 P	86	RX 36 P
15	TX 25 N	39	RX 25 N	63	TX 35 N	87	RX 35 N
16	TX 25 P	40	RX 25 P	64	TX 35 P	88	RX 35 P
17	TX 24 N	41	RX 24 N	65	TX 34 N	89	RX 34 N
18	TX 24 P	42	RX 24 P	66	TX 34 P	90	RX 34 P
19	TX 23 N	43	RX 23 N	67	TX 33 N	91	RX 33 N
20	TX 23 P	44	RX 23 P	68	TX 33 P	92	RX 33 P

**Table 3-15** E-1 Interface Pinouts on Ports 22 to 42 (continued)

Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name	Pin No.	Signal Name
21	TX 22 N	45	RX 22 N	69	NC	93	NC
22	TX 22 P	46	RX 22 P	70	NC	94	NC
23	NC	47	NC	71	NC	95	NC
24	NC	48	NC	72	NC	96	NC

## 3.13 E1-75/120 Impedance Conversion Panel

The ONS 15454 SDH E1-75/120 impedance conversion panel provides front mount electrical connection for 42 ITU-compliant, G.703 E-1 ports. With the E1-75/120 conversion panel, each E1-42 port operates at 2.048 Mbps over a 75-ohm unbalanced coaxial 1.0/2.3 miniature coax connector. [Figure 3-12](#) shows the E1-75/120 faceplate.



**Caution**

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

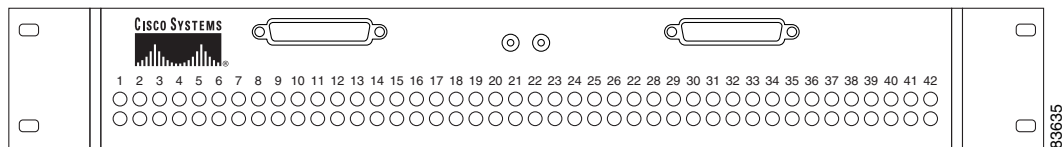
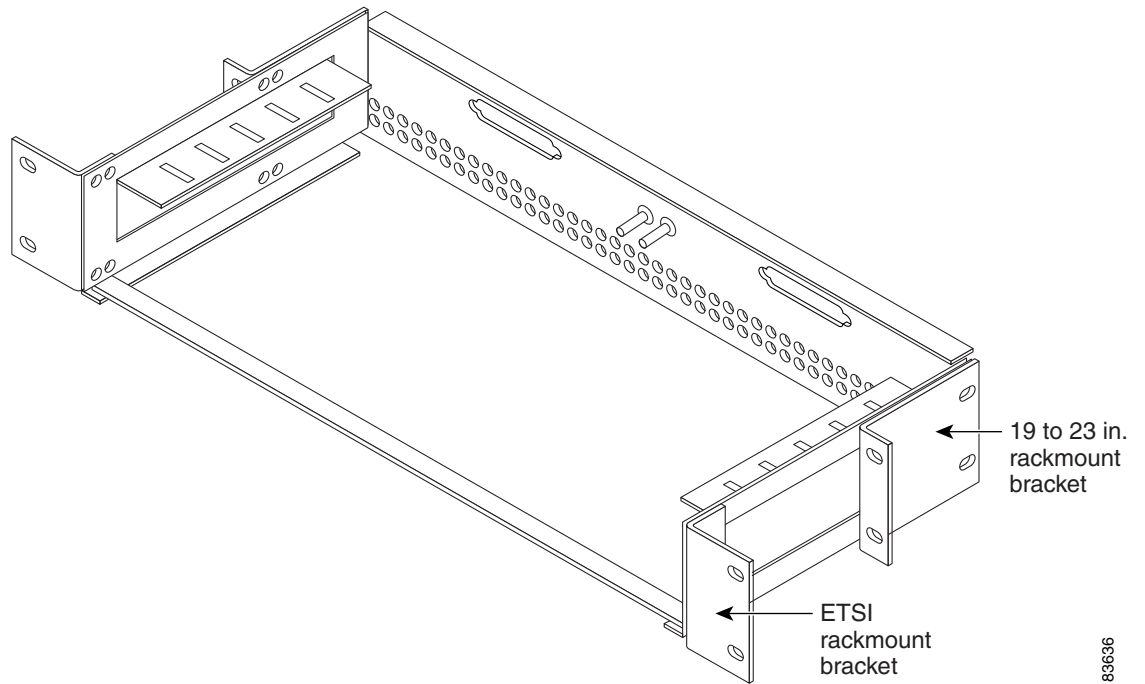
**Figure 3-12** E1-75/120 Impedance Conversion Panel Faceplate

Figure 3-13 shows the E1-75/120 with optional rackmount brackets installed.

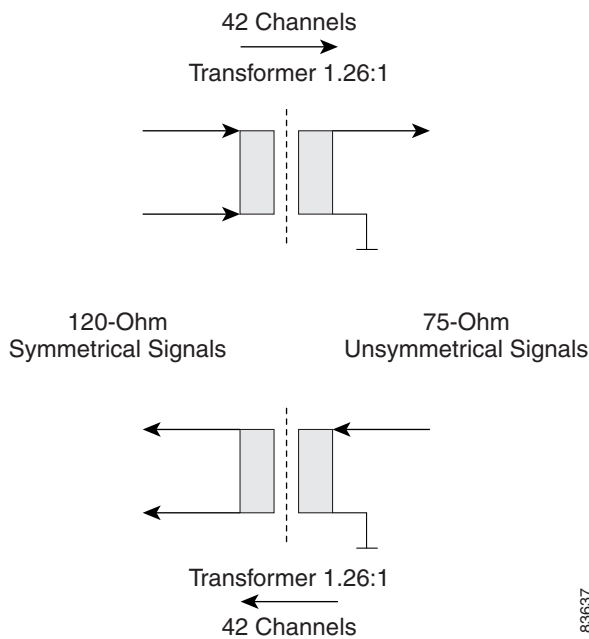
**Figure 3-13 E1-75/120 with Optional Rackmount Brackets**



83636

Figure 3-14 shows a block diagram of the impedance conversion panel.

**Figure 3-14 E1-75/120 Impedance Conversion Panel Block Diagram**



83637

### 3.13.1 E1-75/120 Impedance Conversion Panel Functionality

You can install the E1-75/120 conversion panel in the rack containing the ONS 15454 SDH shelf or in a nearby rack. If you install the E1-75/120 conversion panel in a place where a longer cable is required, make sure that the total cable loss of the balanced 120-ohm cable and the unbalanced 75-ohm cable does not exceed the maximum allowed value. The E1-75/120 conversion panel enables the use of 75-ohm interfaces on client side with the E1-42 card that has 120-ohm interfaces.

Before you can install the E1-75/120 in the rack, install the type of rackmount brackets that is required for the rack that you are using.

## 3.14 FMEC-E3/DS3 Card

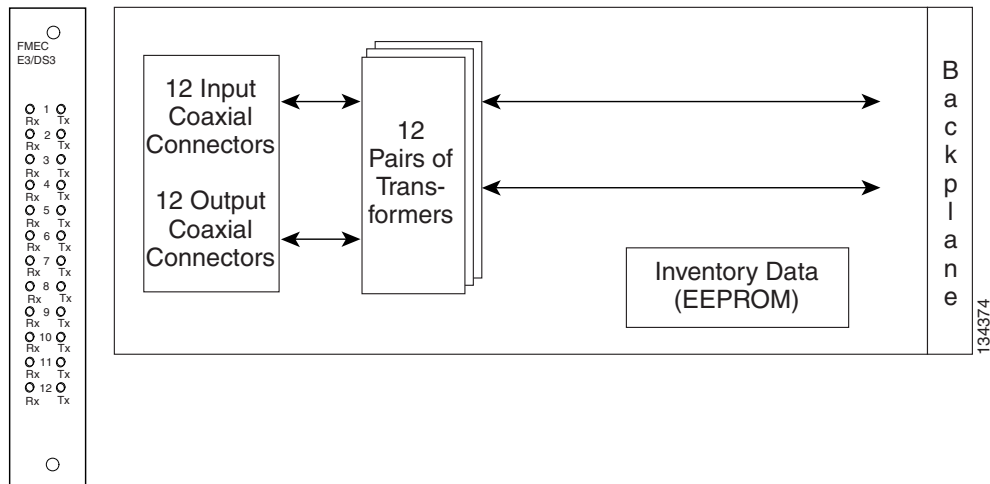
The ONS 15454 SDH FMEC-E3/DS3 card provides front mount electrical connection for 12 ITU-compliant, G.703 E-3 or DS-3 ports. With the FMEC-E3/DS3 card, each interface of an E3-12 card operates at 34.368 Mbps and each interface of a DS3i-N-12 card operates at 44.736 Mbps over a 75-ohm unbalanced coaxial 1.0/2.3 miniature coax connector. [Figure 3-15](#) shows the FMEC-E3/DS3 faceplate and block diagram.



**Caution**

This interface can only be connected to SELV circuits. The interface is not intended for connection to any Australian telecommunications network without the written consent of the network manager.

**Figure 3-15** FMEC-E3/DS3 Faceplate and Block Diagram



You can install the FMEC-E3/DS3 card in any EFCA slot from Slot 18 to 22 or Slot 25 to 29 on the ONS 15454 SDH. Each FMEC-E3/DS3 card interface features E3-level or DS3-level inputs and outputs supporting cable losses:

- E3 signals
  - Up to 12 dB at 17184 kHz
- DS3 signals. One of the following;
  - Up to 137 m (450 ft) 734A, RG59, or 728A

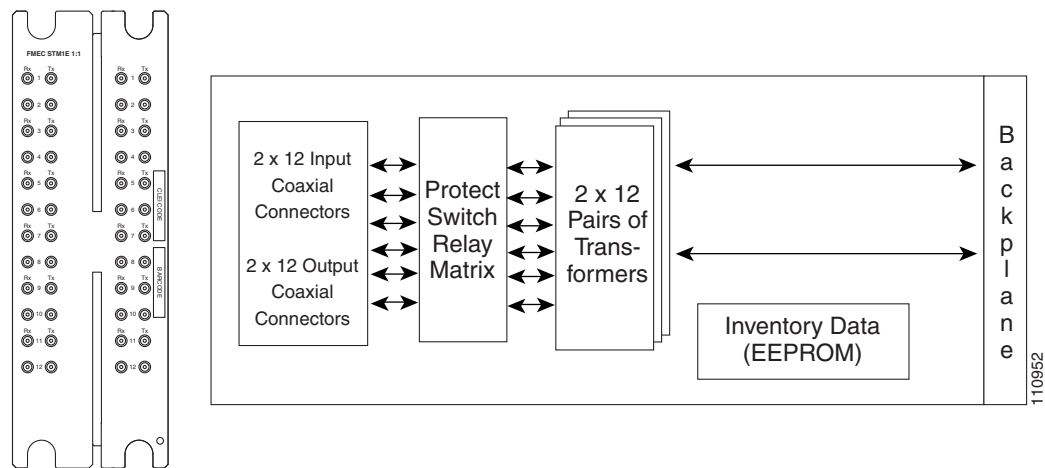
- Up to 24 m (79 ft) RG179

## 3.15 FMEC STM1E 1:1 Card

The ONS 15454 SDH FMEC STM1E 1:1 card provides front mount electrical connection for 2 x 12 ITU-compliant, G.703 STM1E ports. Ports 9 to 12 can be switched to E-4 instead of STM-1 (via CTC, on the STM1E-12 card). With the FMEC STM1E 1:1 card, each interface of an STM1E-12 card operates at 155.52 Mbps for STM-1 or 139.264 Mbps for E-4 over a 75-ohm unbalanced coaxial 1.0/2.3 miniature coax connector. The FMEC STM1E 1:1 card is required if you want to use the STM1E-12 card in 1:1 protection mode or for connection to two unprotected STM1E-12 cards.

Figure 3-16 shows the FMEC STM1E 1:1 faceplate and block diagram.

**Figure 3-16** FMEC STM1E 1:1 Faceplate and Block Diagram



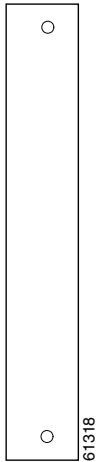
You can install the FMEC STM1E 1:1 card in any EFCA slot pair (18/19, 20/21, 26/27, or 28/29) on the ONS 15454 SDH. Each FMEC STM1E 1:1 card interface features STM1-level inputs and outputs supporting cable losses of up to 12.7 dB at 78 MHz.

## 3.16 FMEC-BLANK Card

The FMEC-BLANK card provides EMC emission control for empty FMEC slots. It also provides a way to close off the EFCA area, thus allowing air flow and convection to be maintained through the EFCA. Figure 3-17 shows the FMEC-BLANK card faceplate.

You must install the BLANK FMEC in every empty FMEC slot to maintain EMC requirements of the system and proper air flow.

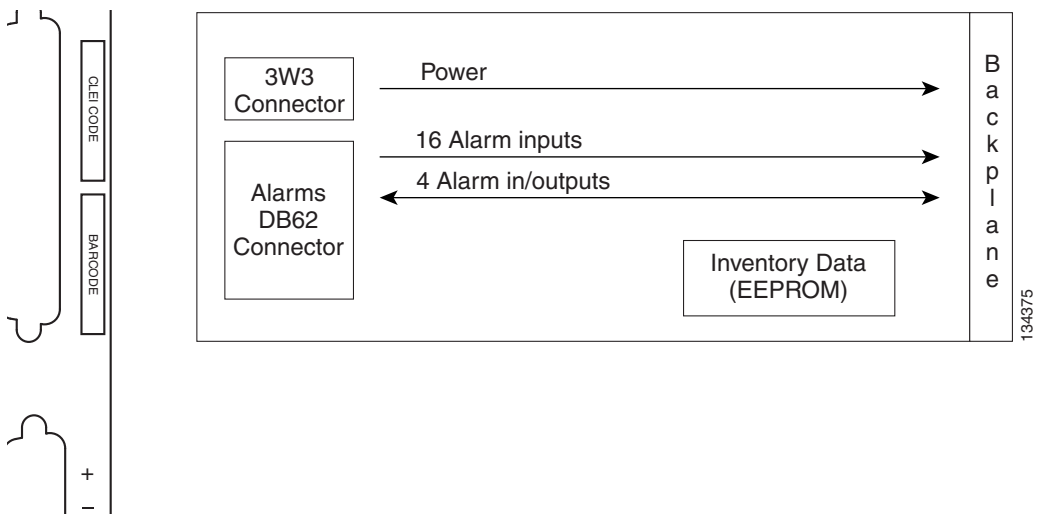
**Figure 3-17 FMEC-BLANK Faceplate**



## 3.17 MIC-A/P FMEC

The MIC-A/P FMEC provides connection for the BATTERY B input, one of the two possible redundant power supply inputs. It also provides connection for eight alarm outputs (coming from the TCC2/TCC2P card), sixteen alarm inputs, and four configurable alarm inputs/outputs. Its position is in Slot 23 in the center of the subrack EFCA area. [Figure 3-18](#) shows the MIC-A/P faceplate and block diagram.

**Figure 3-18 MIC-A/P Faceplate and Block Diagram**



The MIC-A/P FMEC has the following features:

- Connection for one of the two possible redundant power supply inputs
- Connection for eight alarm outputs (coming from the TCC2/TCC2P card)
- Connection for four configurable alarm inputs/outputs
- Connection for sixteen alarm inputs
- Storage of manufacturing and inventory data



**Note**

For proper system operation, both the MIC-A/P and the MIC-C/T/P FMECs must be installed in the ONS 15454 SDH shelf.

**Note**

The MIC-A/P card controls whether FMEC cards on its side of the shelf appear in the CTC graphical user interface (GUI). For example, if the MIC-A/P is removed from the shelf, FMECS to the left of the card may disappear in CTC. This is normal behavior because when the MIC-A/P card is removed, communication can no longer be established with the disappeared FMECS. For more information, refer to the IMPROPROMVL entry in the “Alarm Troubleshooting” chapter of the *Cisco ONS 15454 SDH Troubleshooting Guide*.

## 3.17.1 MIC-A/P Connector Pinouts

Table 3-16 shows the alarm interface pinouts on the MIC-A/P DB-62 connector.

**Table 3-16 Alarm Interface Pinouts on the MIC-A/P DB-62 Connector**

Pin No.	Signal Name	Signal Description	Color
1	ALMCUTOFF N	Alarm cutoff, normally open ACO pair	White/blue
2	ALMCUTOFF P	Alarm cutoff, normally open ACO pair	Blue/white
3	ALMINP0 N	Alarm input pair 1, reports closure on connected wires	White/orange
4	ALMINP0 P	Alarm input pair 1, reports closure on connected wires	Orange/white
5	ALMINP1 N	Alarm input pair 2, reports closure on connected wires	White/green
6	ALMINP1 P	Alarm input pair 2, reports closure on connected wires	Green/white
7	ALMINP2 N	Alarm input pair 3, reports closure on connected wires	White/brown
8	ALMINP2 P	Alarm input pair 3, reports closure on connected wires	Brown/white
9	ALMINP3 N	Alarm input pair 4, reports closure on connected wires	White/gray
10	ALMINP3 P	Alarm input pair 4, reports closure on connected wires	Gray/white
11	EXALM0 N	External customer alarm 1	Red/blue
12	EXALM0 P	External customer alarm 1	Blue/red
13	GND	Frame ground	—
14	EXALM1 N	External customer alarm 2	Red/orange
15	EXALM1 P	External customer alarm 2	Orange/red
16	EXALM2 N	External customer alarm 3	Red/green
17	EXALM2 P	External customer alarm 3	Green/red
18	EXALM3 N	External customer alarm 4	Red/brown
19	EXALM3 P	External customer alarm 4	Brown/red
20	EXALM4 N	External customer alarm 5	Red/gray
21	EXALM4 P	External customer alarm 5	Gray/red
22	EXALM5 N	External customer alarm 6	Black/blue

Table 3-16 Alarm Interface Pinouts on the MIC-A/P DB-62 Connector (continued)

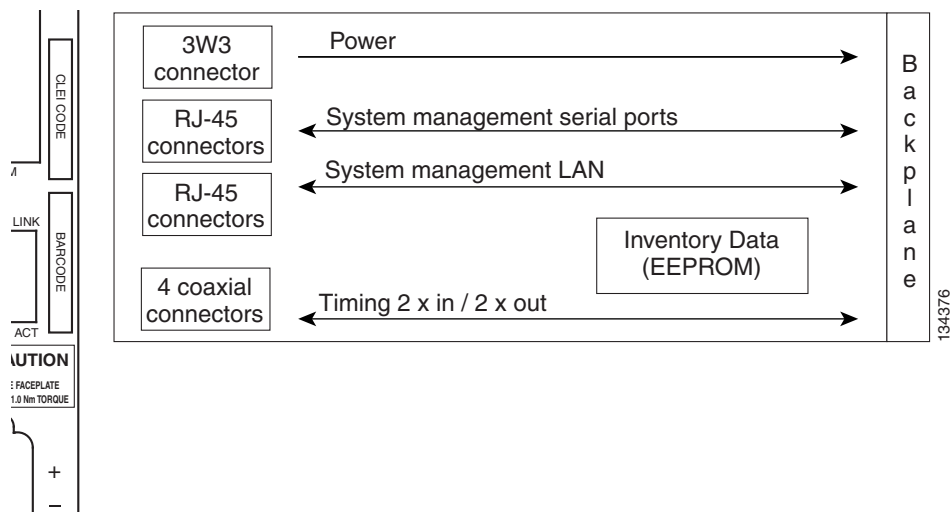
Pin No.	Signal Name	Signal Description	Color
23	EXALM5 P	External customer alarm 6	Blue/black
24	EXALM6 N	External customer alarm 7	Black/orange
25	EXALM6 P	External customer alarm 7	Orange/black
26	GND	Frame ground	—
27	EXALM7 N	External customer alarm 8	Black/green
28	EXALM7 P	External customer alarm 8	Green/black
29	EXALM8 N	External customer alarm 9	Black/brown
30	EXALM8 P	External customer alarm 9	Brown/black
31	EXALM9 N	External customer alarm 10	Black/gray
32	EXALM9 P	External customer alarm 10	Gray/black
33	EXALM10 N	External customer alarm 11	Amber/blue
34	EXALM10 P	External customer alarm 11	Blue/Amber
35	EXALM11 N	External customer alarm 12	Amber/orange
36	EXALM11 P	External customer alarm 12	Orange/Amber
37	ALMOUP0 N	Normally open output pair 1	White/blue
38	ALMOUP0 P	Normally open output pair 1	Blue/white
39	GND	Frame ground	—
40	ALMOUP1 N	Normally open output pair 2	White/orange
41	ALMOUP1 P	Normally open output pair 2	Orange/white
42	ALMOUP2 N	Normally open output pair 3	White/green
43	ALMOUP2 P	Normally open output pair 3	Green/white
44	ALMOUP3 N	Normally open output pair 4	White/brown
45	ALMOUP3 P	Normally open output pair 4	Brown/white
46	AUDALM0 N	Normally open Minor audible alarm	White/gray
47	AUDALM0 P	Normally open Minor audible alarm	Gray/white
48	AUDALM1 N	Normally open Major audible alarm	Red/blue
49	AUDALM1 P	Normally open Major audible alarm	Blue/red
50	AUDALM2 N	Normally open Critical audible alarm	Red/orange
51	AUDALM2 P	Normally open Critical audible alarm	Orange/red
52	GND	Frame ground	—
53	AUDALM3 N	Normally open Remote audible alarm	Red/green
54	AUDALM3 P	Normally open Remote audible alarm	Green/red
55	VISALM0 N	Normally open Minor visual alarm	Red/brown
56	VISALM0 P	Normally open Minor visual alarm	Brown/red
57	VISALM1 N	Normally open Major visual alarm	Red/gray
58	VISALM1 P	Normally open Major visual alarm	Gray/red

**Table 3-16 Alarm Interface Pinouts on the MIC-A/P DB-62 Connector (continued)**

Pin No.	Signal Name	Signal Description	Color
59	VISALM2 N	Normally open Critical visual alarm	Black/blue
60	VISALM2 P	Normally open Critical visual alarm	Blue/black
61	VISALM3 N	Normally open Remote visual alarm	Black/orange
62	VISALM3 P	Normally open Remote visual alarm	Orange/black

## 3.18 MIC-C/T/P FMEC

The MIC-C/T/P FMEC provides connection for the BATTERY A input, one of the two possible redundant power supply inputs. It also provides connection for system management serial port, system management LAN port, modem port (for future use), and system timing inputs and outputs. Install the MIC-C/T/P in Slot 24. [Figure 3-19](#) shows the MIC-C/T/P faceplate and block diagram.

**Figure 3-19 MIC-C/T/P Faceplate and Block Diagram**

The MIC-C/T/P FMEC has the following features:

- Connection for one of the two possible redundant power supply inputs
- Connection for two serial ports for local craft/modem (for future use)
- Connection for one LAN port
- Connection for two system timing inputs
- Connection for two system timing outputs
- Storage of manufacturing and inventory data

**Note**

For proper system operation, both the MIC-A/P and the MIC-C/T/P FMECs must be installed in the shelf.

## 3.18.1 MIC-C/T/P Port-Level Indicators

The MIC-C/T/P FMEC has one pair of LEDs located on the RJ-45 LAN connector. The green LED is on when a link is present, and the amber LED is on when data is being transferred.



## Optical Cards

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This chapter describes the Cisco ONS 15454 SDH optical, transponder, and muxponder card features and functions. It includes descriptions, hardware specifications, and block diagrams for each card. For installation and card turn-up procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [4.1 Optical Card Overview, page 4-1](#)
- [4.2 OC3 IR 4/STM1 SH 1310 Card, page 4-4](#)
- [4.3 OC3 IR/STM1 SH 1310-8 Card, page 4-7](#)
- [4.4 OC12 IR/STM4 SH 1310 Card, page 4-11](#)
- [4.5 OC12 LR/STM4 LH 1310 Card, page 4-12](#)
- [4.6 OC12 LR/STM4 LH 1550 Card, page 4-15](#)
- [4.7 OC12 IR/STM4 SH 1310-4 Card, page 4-17](#)
- [4.8 OC48 IR/STM16 SH AS 1310 Card, page 4-20](#)
- [4.9 OC48 LR/STM16 LH AS 1550 Card, page 4-23](#)
- [4.10 OC48 ELR/STM16 EH 100 GHz Cards, page 4-26](#)
- [4.11 OC192 SR/STM64 IO 1310 Card, page 4-29](#)
- [4.12 OC192 IR/STM64 SH 1550 Card, page 4-32](#)
- [4.13 OC192 LR/STM64 LH 1550 Card, page 4-35](#)
- [4.14 OC192 LR/STM64 LH ITU 15xx.xx Card, page 4-39](#)

### 4.1 Optical Card Overview

The optical card overview section summarizes card functions and compatibility.



**Note**

Each card is marked with a symbol that corresponds to a slot (or slots) on the ONS 15454 shelf assembly. The cards are then installed into slots displaying the same symbols. See the [“1.12.1 Card Slot Requirements” section on page 1-15](#) for a list of slots and symbols.

## 4.1.1 Card Summary

Table 4-1 lists the ONS 15454 SDH optical cards.

**Table 4-1** *Optical Cards for the ONS 15454 SDH*

Card	Description	For Additional Information...
<b>OC3 IR 4/STM1 SH 1310</b>	The OC3 IR 4/STM1 SH 1310 card provides four intermediate- or short-range STM-1 ports and operates at 1310 nm. It operates in Slots 1 to 6 and 12 to 17.	See the “4.2 OC3 IR 4/STM1 SH 1310 Card” section on page 4-4.
<b>OC3 IR/STM1 SH 1310-8</b>	The OC3IR/STM1SH 1310-8 card provides eight intermediate- or short-range STM-1 ports and operates at 1310 nm. It operates in Slots 1 to 4 and 14 to 17.	See the “4.3 OC3 IR/STM1 SH 1310-8 Card” section on page 4-7.
<b>OC12 IR/STM4 SH 1310</b>	The OC12 IR/STM4 SH 1310 card provides one intermediate- or short-range STM-4 port and operates at 1310 nm. It operates in Slots 1 to 6 and 12 to 17.	See the “4.4 OC12 IR/STM4 SH 1310 Card” section on page 4-11.
<b>OC12 LR/STM4 LH 1310</b>	The OC12 LR/STM4 LH 1310 card provides one long-range STM-4 port and operates at 1310 nm. It operates in Slots 1 to 6 and 12 to 17.	See the “4.5 OC12 LR/STM4 LH 1310 Card” section on page 4-12.
<b>OC12 LR/STM4 LH 1550</b>	The OC12 LR/STM4 LH 1550 card provides one long-range STM-4 port and operates at 1550 nm. It operates in Slots 1 to 6 and 12 to 17.	See the “4.6 OC12 LR/STM4 LH 1550 Card” section on page 4-15.
<b>OC12 IR/STM4 SH 1310-4</b>	The OC12 IR/STM4 SH 1310-4 card provides four intermediate- or short-range STM-4 ports and operates at 1310 nm. It operates in Slots 1 to 4 and 14 to 17.	See the “4.7 OC12 IR/STM4 SH 1310-4 Card” section on page 4-17.
<b>OC48 IR/STM16 SH AS 1310</b>	The OC48 IR/STM16 SH AS 1310 card provides one intermediate- or short-range STM-16 port at 1310 nm and operates in Slots 1 to 6 and 12 to 17.	See the “4.8 OC48 IR/STM16 SH AS 1310 Card” section on page 4-20.
<b>OC48 LR/STM16 LH AS 1550</b>	The OC48 LR/STM16 LH AS 1550 card provides one long-range STM-16 port at 1550 nm and operates in Slots 1 to 6 and 12 to 17.	See the “4.9 OC48 LR/STM16 LH AS 1550 Card” section on page 4-23.
<b>OC48 ELR/STM16 EH 100 GHz</b>	The OC48 ELR/STM16 EH 100 GHz card provides one long-range (enhanced) STM-16 port and operates in Slots 5, 6, 12, or 13. This card is available in 18 different wavelengths (9 in the blue band and 9 in the red band) in the 1550-nm range, every second wavelength in the ITU grid for 100-GHz spacing dense wavelength division multiplexing (DWDM).	See the “4.10 OC48 ELR/STM16 EH 100 GHz Cards” section on page 4-26.
<b>OC192 SR/STM64 IO 1310</b>	The OC192 SR/STM64 IO 1310 card provides one intra-office-haul STM-64 port at 1310 nm and operates in Slots 5, 6, 12, or 13 with the 10 Gbps cross-connect (XC10G) card.	See the “4.11 OC192 SR/STM64 IO 1310 Card” section on page 4-29.
<b>OC192 IR/STM64 SH 1550</b>	The OC192 IR/STM64 SH 1550 card provides one intermediate-range STM-64 port at 1550 nm and operates in Slots 5, 6, 12, or 13 with the XC10G card.	See the “4.12 OC192 IR/STM64 SH 1550 Card” section on page 4-32.

**Table 4-1** Optical Cards for the ONS 15454 SDH (continued)

Card	Description	For Additional Information...
<b>OC192 LR/STM64 LH 1550</b>	The OC192 LR/STM64 LH 1550 card provides one long-range STM-64 port at 1550 nm and operates in Slots 5, 6, 12, or 13 with the XC10G card.	See the “4.13 OC192 LR/STM64 LH 1550 Card” section on page 4-35.
<b>OC192 LR/STM64 LH ITU 15xx.xx</b>	The OC192 LR/STM64 LH ITU 15xx.xx card provides one extended long-range STM-64 port and operates in Slots 5, 6, 12, or 13 with the XC10G card. This card is available in multiple wavelengths in the 1550-nm range of the ITU grid for 100-GHz-spaced DWDM.	See the “4.14 OC192 LR/STM64 LH ITU 15xx.xx Card” section on page 4-39.

**Note**

The Cisco OC3 IR/STM1 SH 1310-8, OC12 IR/STM4 SH 1310, and OC48 IR/STM16 SH AS 1310 interface optics, all working on 1310 nm, are optimized for the most widely used SMF-28 fiber, available from many suppliers.

Corning MetroCor fiber is optimized for optical interfaces that transmit at 1550 nm or in the C and L DWDM windows, and targets interfaces with higher dispersion tolerances than those found in OC3 IR/STM1 SH 1310-8, OC12 IR/STM4 SH 1310, and OC48 IR/STM16 SH AS1310 interface optics. If you are using Corning MetroCor fiber, OC3 IR/STM1 SH 1310-8, OC12 IR/STM4 SH 1310, and OC48 IR/STM16 SH AS 1310 interface optics become dispersion limited before they become attenuation limited. In this case, consider using OC12 LR/STM4 LH 1550 and OC48 LR/STM16 LH 1550 AS cards instead of OC12 IR/STM4 SH and OC48 IR/STM16 SH cards.

With all fiber types, network planners/engineers should review the relative fiber type and optics specifications to determine attenuation, dispersion, and other characteristics to ensure appropriate deployment.

## 4.1.2 Card Compatibility

Table 4-2 lists the CTC software compatibility for each optical card. See Table 2-5 on page 2-4 for a list of cross-connect cards that are compatible with each optical card.

**Table 4-2** Optical Card Software Release Compatibility

Optical Card	R2.2.1	R2.2.2	R3.0.1	R3.1	R3.2	R3.3	R3.4	R4.0	R4.1	R4.5	R4.6	R4.7	R5.0
<b>OC3 IR 4/STM1 SH 1310</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
<b>OC3 IR /STM1 SH 1310-8</b>	—	—	—	—	—	—	—	Yes	Yes	—	Yes	—	Yes
<b>OC12 IR/STM4 SH 1310</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
<b>OC12 LR/STM4 LH 1310</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
<b>OC12 LR/STM4 LH 1550</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes

Table 4-2 Optical Card Software Release Compatibility (continued)

Optical Card	R2.2.1	R2.2.2	R3.0.1	R3.1	R3.2	R3.3	R3.4	R4.0	R4.1	R4.5	R4.6	R4.7	R5.0
OC12 IR/STM4 SH 1310-4	—	—	—	—	—	Yes	Yes	Yes	Yes	—	Yes	—	Yes
OC48 IR/STM16 SH AS 1310	—	—	—	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
OC48 LR/STM16 LH AS 1550	—	—	—	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
OC48 ELR/STM16 EH 100 GHz	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
OC48 ELR 200 GHz	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
OC192 SR/STM64 IO 1310	—	—	—	—	—	—	—	Yes	Yes	—	Yes	—	Yes
OC192 IR/STM64 SH 1550	—	—	—	—	—	—	—	Yes	Yes	—	Yes	—	Yes
OC192 LR/STM64 LH 1550 (15454-OC192LR1550)	—	—	—	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
OC192 LR/STM64 LH 1550 (15454-OC192-LR2)	—	—	—	—	—	—	—	Yes	Yes	—	Yes	—	Yes
OC192 LR/STM64 LH ITU 15xx.xx	—	—	—	—	—	—	—	Yes	Yes	—	Yes	—	Yes

## 4.2 OC3 IR 4/STM1 SH 1310 Card

The OC3 IR 4/STM1 SH 1310 card provides four intermediate or short range SDH STM-1 ports compliant with ITU-T G.707 and ITU-T G.957. Each port operates at 155.52 Mbps over a single-mode fiber span. The card supports VC-4 and nonconcatenated or concatenated payloads at the STM-1 signal level.



Figure 4-1 shows the OC3 IR 4/STM1 SH 1310 faceplate.

**Figure 4-1** OC3 IR 4/STM1 SH 1310 Faceplate

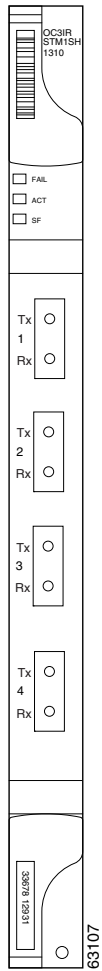
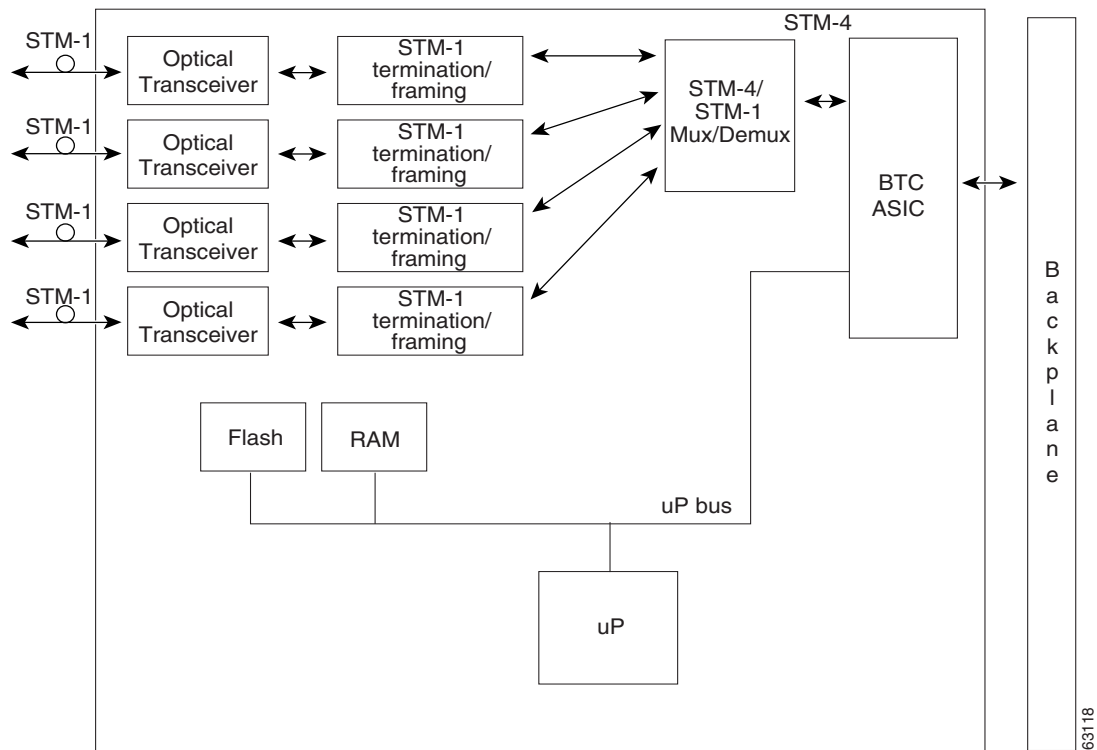


Figure 4-2 shows a block diagram of the four-port OC-3 card.

Figure 4-2 OC3 IR 4/STM1 SH 1310 Block Diagram



## 4.2.1 OC3 IR 4/STM1 SH 1310 Functionality

You can install the OC3 IR 4/STM1 SH 1310 card in Slots 1 to 6 and 12 to 17. The card can be provisioned as part of a subnetwork connection protection (SNCP) ring or linear add-drop multiplexer (ADM) configuration. Each interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors.

The OC3 IR 4/STM1 SH 1310 card supports 1+1 unidirectional and bidirectional protection switching. You can provision protection on a per port basis.

The OC3 IR 4/STM1 SH 1310 card detects loss of signal (LOS), loss of frame (LOF), loss of pointer (LOP), multiplex section alarm indication signal (MS-AIS), and multiplex section far-end receive failure (MS-FERF) conditions. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line bit interleaved parity (BIP) errors.

To enable an MSP-SPRing, the OC3 IR 4/STM1 SH 1310 card extracts the K1 and K2 bytes from the SDH overhead to perform appropriate protection switches. The data communication channel/generic communication channel (GCC) bytes are forwarded to the TCC2 card, which terminates the GCC.

## 4.2.2 OC3 IR 4/STM1 SH 1310 Card-Level Indicators

Table 4-3 describes the three card-level LED indicators on the OC3 IR 4/STM1 SH 1310 card.

**Table 4-3** OC3 IR 4/STM1 SH 1310 Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
Green ACT LED	The green ACT LED indicates that the card is carrying traffic or is traffic-ready.
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, MS-AIS, or high BER on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the links are working, the light turns off.

## 4.2.3 OC3 IR 4/STM1 SH 1310 Port-Level Indicators

Eight bicolor LEDs show the status per port. The LEDs show green if the port is available to carry traffic, is provisioned as in-service, and is part of a protection group, in the active mode. You can find the status of the four card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.3 OC3 IR/STM1 SH 1310-8 Card

The OC3 IR/STM1 SH 1310-8 card provides eight intermediate or short range SDH STM-1 ports compliant with ITU-T G.707, and ITU-T G.957. Each port operates at 155.52 Mbps over a single-mode fiber span. The card supports VC-4 and nonconcatenated or concatenated payloads at the STM-1 signal level. Figure 4-3 shows the card faceplate.

**Figure 4-3** OC3 IR/STM1 SH 1310-8 Faceplate

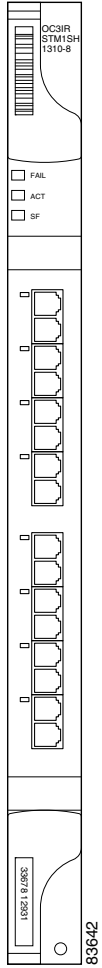
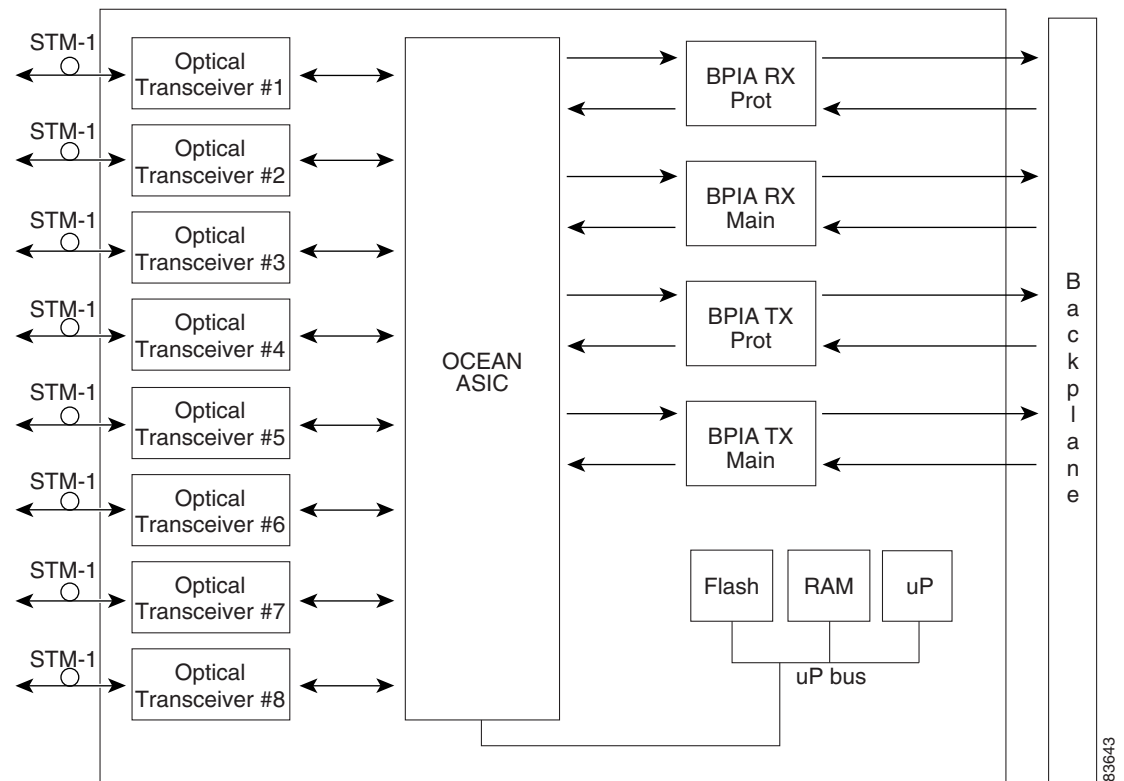


Figure 4-4 shows a block diagram of the OC3 IR/STM1 SH 1310-8 card.

**Figure 4-4** OC3 IR/STM1 SH 1310-8 Block Diagram



You can install the OC3IR/STM1 SH 1310-8 card in Slots 1 to 4 and 14 to 17. The card can be provisioned as part of an SNCP or in an (ADM) configuration. Each interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses LC connectors on the faceplate, angled downward 12.5 degrees.

The OC3IR/STM1 SH 1310-8 card supports 1+1 unidirectional and bidirectional protection switching. You can provision protection on a per port basis.

The OC3IR/STM1 SH 1310-8 card detects loss of signal (LOS), loss of frame (LOF), loss of pointer (LOP), multiplex section alarm indicator signal (MS-AIS), and multiplex section far-end receive failure (MS-FERF) conditions. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line bit interleaved parity (BIP) errors.

To enable an MSP-SPRing, the OC3 IR/STM1 SH 1310-8 card extracts the K1 and K2 bytes from the SDH overhead to perform appropriate protection switches. The OC3IR/STM1 SH 1310-8 card supports full GCC connectivity for remote network management.

## 4.3.1 OC3 IR/STM1 SH 1310-8 Card-Level Indicators

Table 4-4 describes the three card-level LED indicators for the OC3IR/STM1 SH 1310-8 card.

**Table 4-4** OC3IR/STM1 SH 1310-8 Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
Green ACT LED	The green ACT LED indicates that the card is carrying traffic or is traffic-ready.
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, MS-AIS, or high BER on one or more of the card's ports. The amber signal fail (SF) LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the links are working, the light turns off.

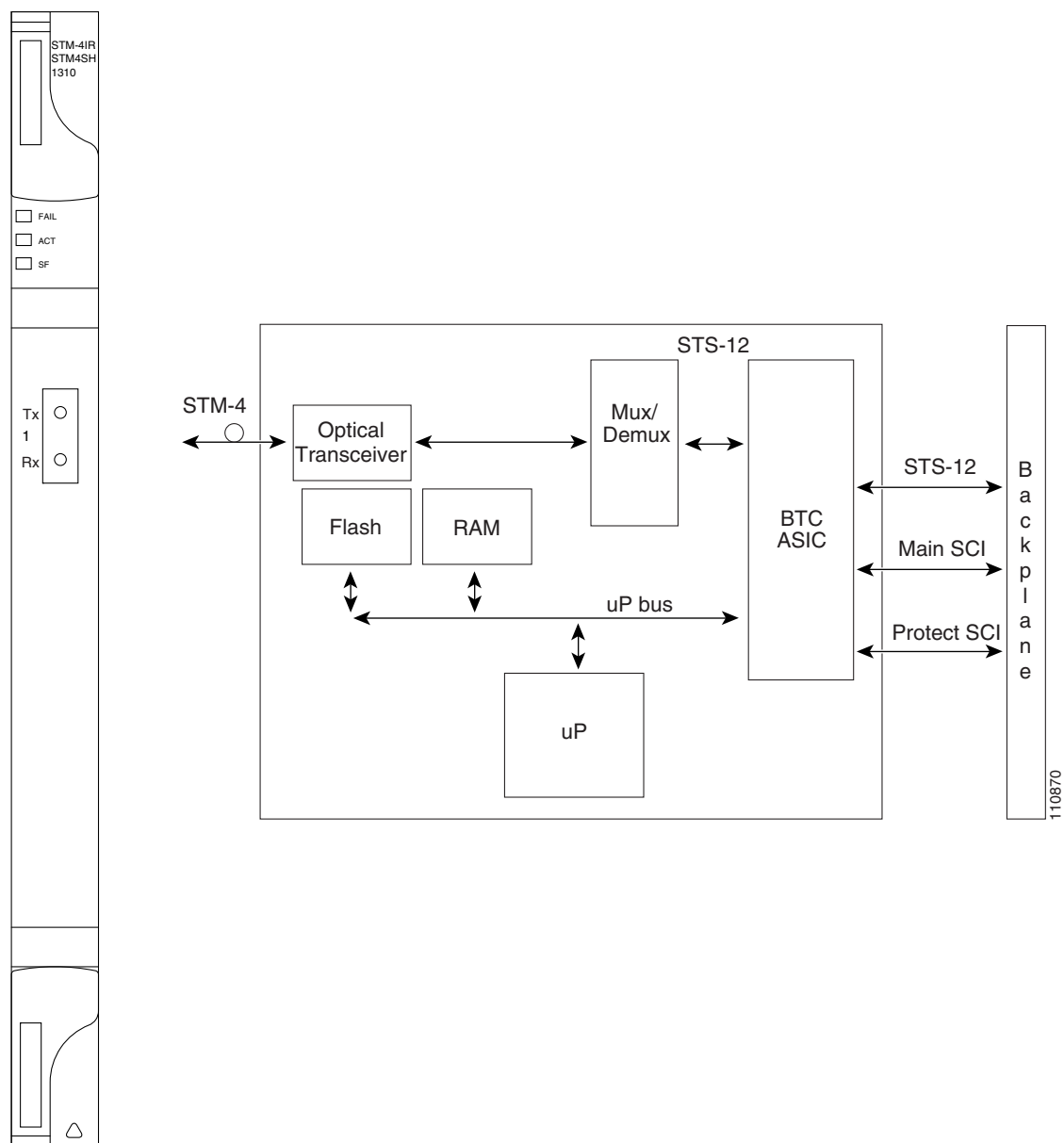
## 4.3.2 OC3 IR/STM1 SH 1310-8 Port-Level Indicators

Eight bicolor LEDs show the status per port. The LEDs show green if the port is available to carry traffic, is provisioned as in-service, is part of a protection group, or in the active mode. You can also find the status of the eight card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.4 OC12 IR/STM4 SH 1310 Card

The OC12 IR/STM4 SH 1310 card provides one intermediate or short range SDH STM-4 port compliant with ITU-T G.707 and ITU-T G.957. The port operates at 622.08 Mbps over a single-mode fiber span. The card supports VC-4 and nonconcatenated or concatenated payloads at STM-1 and STM-4 signal levels. Figure 4-5 shows the OC12 IR/STM4 SH 1310 faceplate and a block diagram of the card.

**Figure 4-5** OC12 IR/STM4 SH 1310 Faceplate and Block Diagram



You can install the OC12 IR/STM4 SH 1310 card in Slots 1 to 6 and 12 to 17 and provision the card as part of an MSP-SPRing or subnetwork connection protection (SNCP) ring. In ADM configurations, you can provision the card as either an access tributary or a transport span (trunk) side interface.

The OC12 IR/STM4 SH 1310 card interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The OC12 IR/STM4 SH 1310 card uses SC optical connections and supports 1+1 unidirectional and bidirectional protection.

The OC12 IR/STM4 SH 1310 detects LOS, LOF, LOP, MS-AIS, and MS-FERF conditions. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors.

To enable an MSP-SPRing, the OC12 IR/STM4 SH 1310 extracts the K1 and K2 bytes from the SDH overhead to perform appropriate protection switches. The GCC bytes are forwarded to the TCC2 card, which terminates the GCC.

## 4.4.1 OC12 IR/STM4 SH 1310 Card-Level Indicators

Table 4-5 describes the three card-level LED indicators on the OC12 IR/STM4 SH 1310 card.

**Table 4-5** OC12 IR/STM4 SH 1310 Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
Green/Amber ACT LED	The green ACT LED indicates that the card is operational and is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, MS-AIS, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## 4.4.2 OC12 IR/STM4 SH 1310 Port-Level Indicators

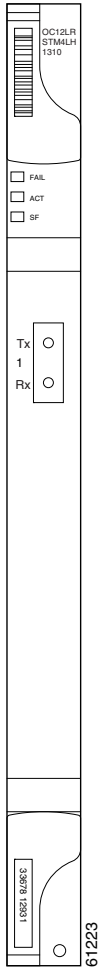
You can find the status of the OC12 IR/STM4 SH 1310 card port using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.5 OC12 LR/STM4 LH 1310 Card

The OC12 LR/STM4 LH 1310 card provides one long-range SDH STM-4 port per card compliant with ITU-T G.707, and ITU-T G.957. The port operates at 622.08 Mbps over a single-mode fiber span. The card supports VC-4 and nonconcatenated or concatenated payloads at STM-1 and STM-4 signal levels. Figure 4-6 shows the OC12 LR/STM4 LH 1310 faceplate.



Figure 4-6 OC12 LR/STM4 LH 1310 Faceplate





**Table 4-6** OC12 LR/STM4 LH 1310 Card-Level Indicators (continued)

Card-Level LED	Description
Green/Amber ACT LED	The green ACT LED indicates that the card is operational and is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, MS-AIS, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## 4.5.2 OC12 LR/STM4 LH 1310 Port-Level Indicators

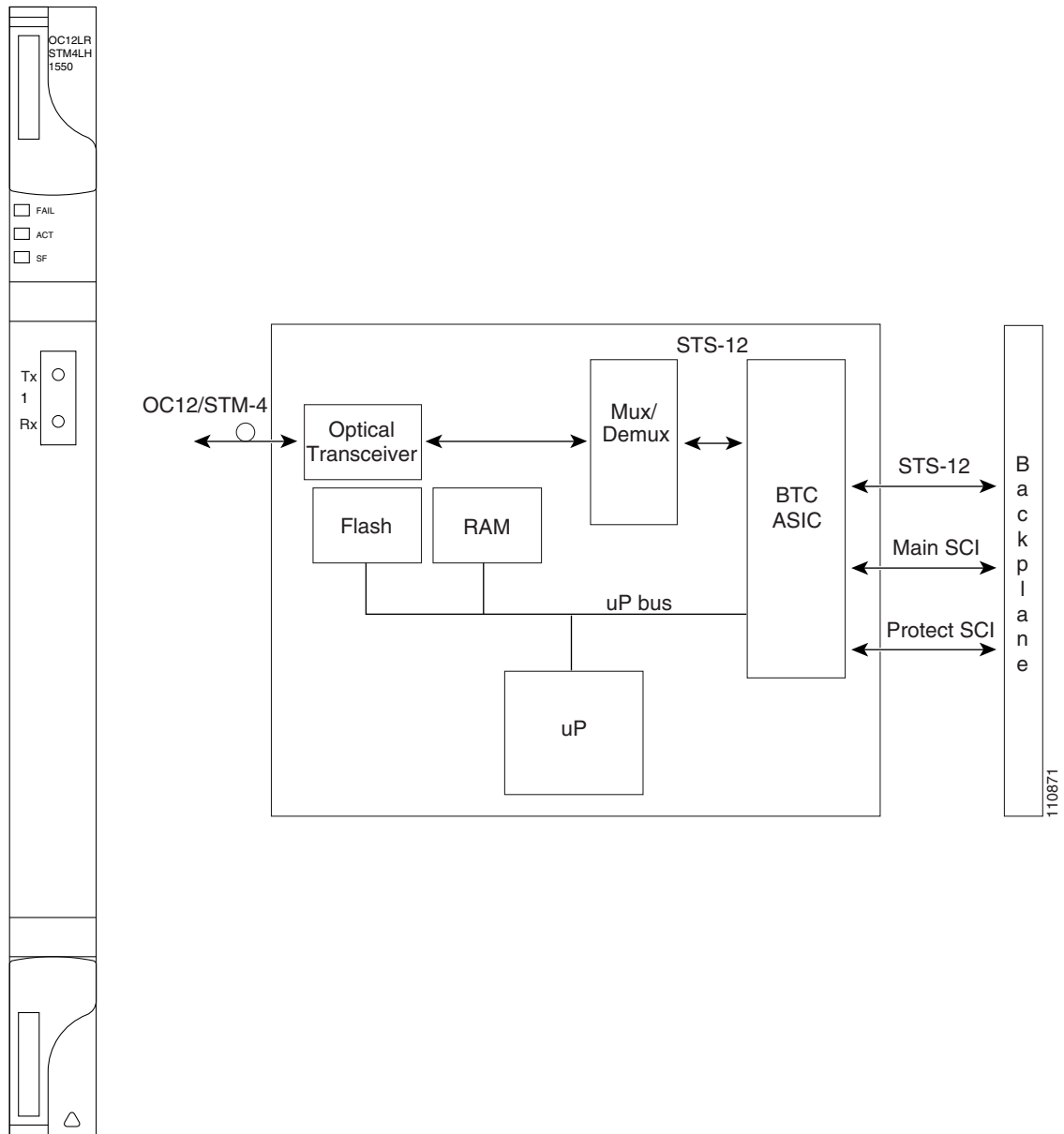
You can find the status of the OC12 LR/STM4 LH 1310 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.6 OC12 LR/STM4 LH 1550 Card

The OC12 LR/STM4 LH 1550 card provides one long-range, ITU-T G.707- and G.957-compliant, SDH STM-4 port per card. The interface operates at 622.08 Mbps over a single-mode fiber span. The card supports concatenated or nonconcatenated payloads on a per VC-4 basis. [Figure 4-8](#) shows the OC12 LR/STM4 LH 1550 faceplate.

Figure 4-8 shows the OC12 LR/STM4 LH 1550 faceplate and a block diagram of the card.

**Figure 4-8** OC12 LR/STM4 LH 1550 Faceplate and Block Diagram



## 4.6.1 OC12 LR/STM4 LH 1550 Card Functionality

You can install the OC12 LR/STM4 LH 1550 card in Slots 1 to 6 or 12 to 17. You can provision the card as part of an MSP-SPRing or SNCP ring. In ADM configurations, you can provision the card as either an access tributary or a transport span-side interface.

The OC12 LR/STM4 LH 1550 card uses long-reach optics centered at 1550 nm and contains a transmit and receive connector (labeled) on the card faceplate. The OC12 LR/STM4 LH 1550 card uses SC optical connections and supports 1+1 bidirectional or unidirectional protection switching.

The OC12 LR/STM4 LH 1550 card detects LOS, LOF, LOP, MS-AIS, and MS-FERF conditions. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors.

To enable an MSP-SPRing, the OC12 LR/STM4 LH 1550 extracts the K1 and K2 bytes from the SDH overhead and processes them to switch accordingly. The GCC bytes are forwarded to the TCC2 card, which terminates the GCC.

## 4.6.2 OC12 LR/STM4 LH 1550 Card-Level Indicators

Table 4-7 describes the three card-level LED indicators on the OC12 LR/STM4 LH 1550 card.

**Table 4-7** OC12 LR/STM4 LH 1550 Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
Green/Amber ACT LED	The green ACT LED indicates that the card is operational and ready to carry traffic. The amber ACT LED indicates that the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, MS-AIS, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## 4.6.3 OC12 LR/STM4 LH 1550 Port-Level Indicators

You can find the status of the OC12 LR/STM4 LH 1550 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.7 OC12 IR/STM4 SH 1310-4 Card

The OC12 IR/STM4 SH 1310-4 card provides four intermediate or short range SDH STM-4 ports compliant with ITU-T G.707, and ITU-T G.957. Each port operates at 622.08 Mbps over a single-mode fiber span. The card supports concatenated or nonconcatenated payloads on a per VC-4 basis. Figure 4-9 shows the OC12 IR/STM4 SH 1310-4 faceplate.

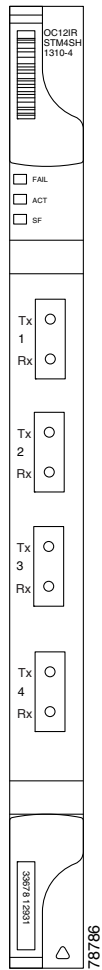
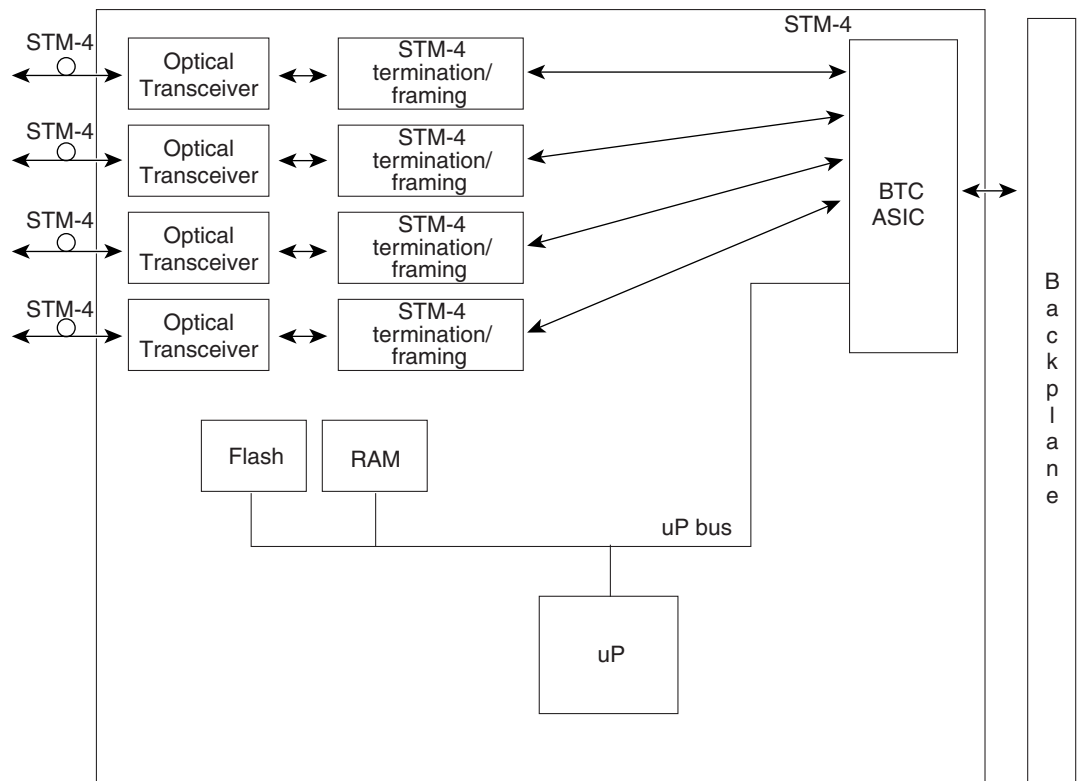
**Figure 4-9** OC12 IR/STM4 SH 1310-4 Faceplate

Figure 4-10 shows a block diagram of the card.

Figure 4-10 OC12 IR/STM4 SH 1310-4 Block Diagram



## 4.7.1 OC12 IR/STM4 SH 1310-4 Card Functionality

You can install the OC12 IR/STM4 SH 1310-4 card in Slots 1 to 4 and 14 to 17. The card can be provisioned as part of an SNCP, part of a multiplex section-shared protection ring (MS-SPRing), or in an ADM/TM configuration. Each interface features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors.

The OC12 IR/STM4 SH 1310-4 card supports 1+1 unidirectional and bidirectional protection switching. You can provision protection on a per port basis.

The OC12 IR/STM4 SH 1310-4 card detects LOS, LOF, LOP, MS-AIS, and MS-FERF conditions. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors.

Each port is configurable to support all ONS 15454 SDH configurations and can be provisioned as part of an MS-SPRing or SNCP configuration.

To enable an MSP-SPRing, the OC12 IR/STM4 SH 1310-4 card extracts the K1 and K2 bytes from the SDH overhead and processes them to switch accordingly. The GCC bytes are forwarded to the TCC2 card, which terminates the GCC.

**Note**

If you ever expect to upgrade an OC-12/STM-4 ring to a higher bit rate, you should not put an OC12 IR/STM4 SH 1310-4 card in that ring. The four-port card is not upgradable to a single-port card. The reason is that four different spans, possibly going to four different nodes, cannot be merged to a single span.

## 4.7.2 OC12 IR/STM4 SH 1310-4 Card-Level Indicators

Table 4-8 describes the three card-level LED indicators on the OC12 IR/STM4 SH 1310-4 card.

**Table 4-8** OC12 IR/STM4 SH 1310-4 Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
Green ACT LED	The green ACT LED indicates that the card is carrying traffic or is traffic-ready.
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, MS-AIS, or high BER on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the links are working, the light turns off.

## 4.7.3 OC12 IR/STM4 SH 1310-4 Port-Level Indicators

You can find the status of the four card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.8 OC48 IR/STM16 SH AS 1310 Card

The OC48 IR/STM16 SH AS 1310 card provides one intermediate-range, ITU-T G.707- and G.957-compliant, SDH STM-16 port per card. The interface operates at 2.488 Gbps over a single-mode fiber span. The card supports concatenated or nonconcatenated payloads at STM-1, STM-4, or STM-16 signal levels on a per VC-4 basis. Figure 4-11 shows the OC48 IR/STM16 SH AS 1310 faceplate.



Figure 4-11 OC48 IR/STM16 SH AS 1310 Faceplate

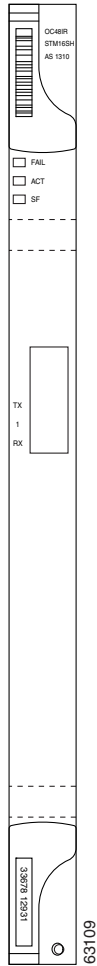
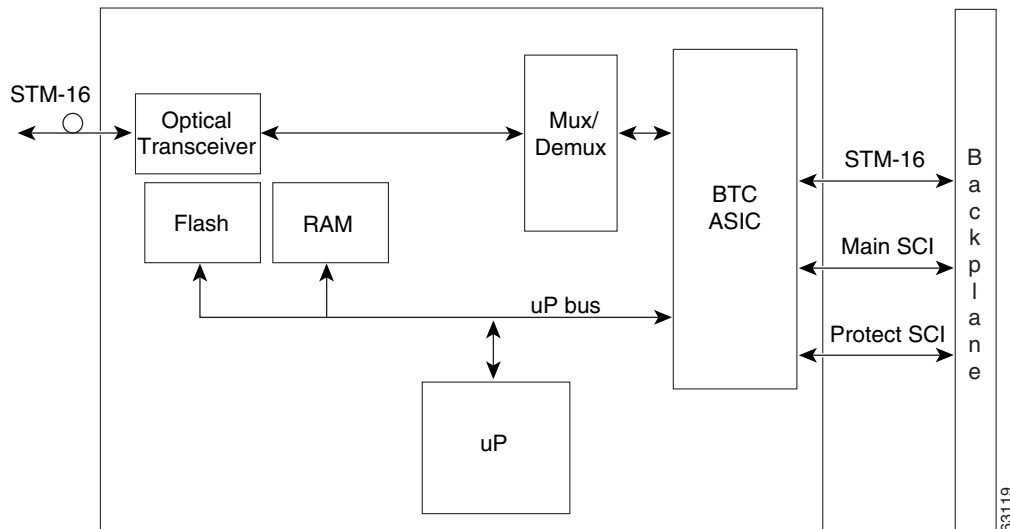


Figure 4-12 shows a block diagram of the card.

**Figure 4-12 OC48 IR/STM16 SH AS 1310 Block Diagram**



## 4.8.1 OC48 IR/STM16 SH AS 1310 Card Functionality

You can install the OC48 IR/STM16 SH AS 1310 card in Slots 1 to 6 and 12 to 17. You can provision the card as part of a MS-SPRing or SNCP. In an ADM configuration, you can provision the card as either an access tributary or a transport span interface.

The STM-16 port features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The OC48 IR/STM16 SH AS 1310 card uses SC connectors. The card supports 1+1 unidirectional protection and provisionable bidirectional switching.

The OC48 IR/STM16 SH AS 1310 card detects LOS, LOF, LOP, MS-AIS, and MS-FERF conditions. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors.

## 4.8.2 OC48 IR/STM16 SH AS 1310 Card-Level Indicators

Table 4-9 describes the three card-level LED indicators on the OC48 IR/STM16 SH AS 1310 card.

**Table 4-9 OC48 IR/STM16 SH AS 1310 Card-Level Indicators**

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.

**Table 4-9** OC48 IR/STM16 SH AS 1310 Card-Level Indicators (continued)

Card-Level LED	Description
Green/Amber ACT LED	The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, MS-AIS, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

### 4.8.3 OC48 IR/STM16 SH AS 1310 Port-Level Indicators

You can find the status of the OC48 IR/STM16 SH AS 1310 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.9 OC48 LR/STM16 LH AS 1550 Card

The OC48 LR/STM16 LH AS 1550 card provides one long-range, ITU-T G.707- and G.957-compliant, SDH STM-16 port per card. The interface operates at 2.488 Gbps over a single-mode fiber span. The card supports concatenated or nonconcatenated payloads at STM-1, STM-4, or STM-16 signal levels on a per VC-4 basis. [Figure 4-13](#) shows the OC48 LR/STM16 LH AS 1550 faceplate.

**Figure 4-13** OC48 LR/STM16 LH AS 1550 Faceplate

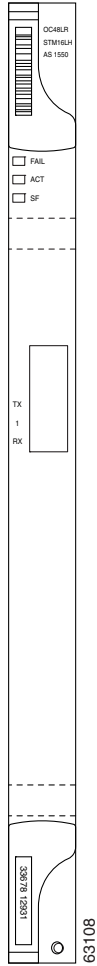
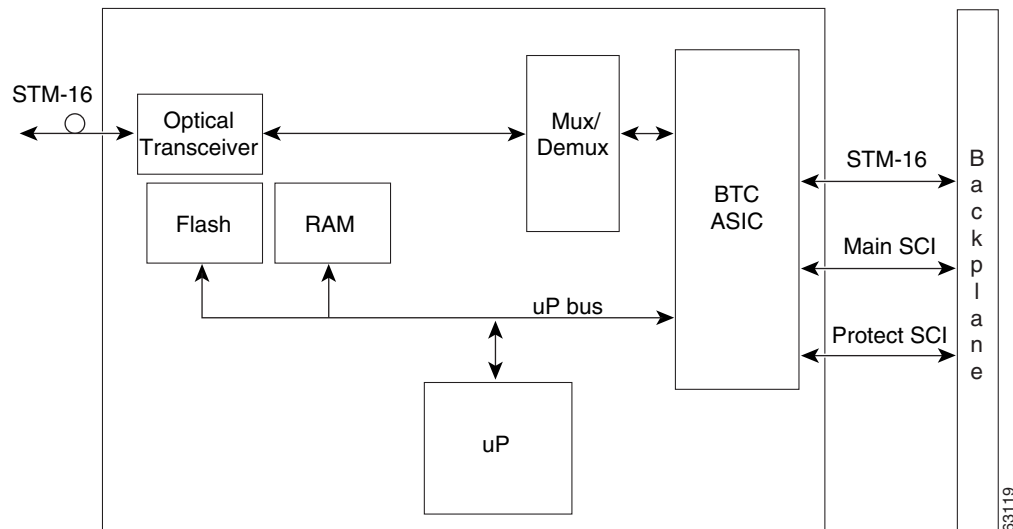


Figure 4-14 shows a block diagram of the card.

**Figure 4-14 OC48 LR/STM16 LH AS 1550 Block Diagram**



## 4.9.1 OC48 LR/STM16 LH AS 1550 Card Functionality

You can install OC48 LR/STM16 LH AS 1550 cards in Slots 1 to 6 or 12 to 17. You can provision this card as part of a MS-SPRing or SNCP. In an ADM/TM configuration, you can provision the card as either an access tributary or a transport span interface.

The OC48 LR/STM16 LH AS 1550 port features a 1550-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors, and it supports 1+1 unidirectional protection and provisionable bidirectional and unidirectional switching.

The OC48 LR/STM16 LH AS 1550 detects LOS, LOF, LOP, MS-AIS, and MS-FERF conditions. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors.

## 4.9.2 OC48 LR/STM16 LH AS 1550 Card-Level Indicators

Table 4-10 describes the three card-level LED indicators on the OC48 LR/STM16 LH AS 1550 card.

**Table 4-10 OC48 LR/STM16 LH AS 1550 Card-Level Indicators**

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.

**Table 4-10** OC48 LR/STM16 LH AS 1550 Card-Level Indicators (continued)

Card-Level LED	Description
Green/Amber ACT LED	The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## 4.9.3 OC48 LR/STM16 LH AS 1550 Port-Level Indicators

You can find the status of the OC48 LR/STM16 LH AS 1550 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.10 OC48 ELR/STM16 EH 100 GHz Cards

Eighteen distinct STM-16 ITU 100-GHz DWDM cards comprise the ONS 15454 SDH DWDM channel plan. This plan contains every second wavelength in the ITU grid for 100-GHz-spaced DWDM. Though the ONS 15454 SDH only uses 200-GHz spacing, the cards work in 100-GHz-spaced nodes, as well.

Each OC48 ELR/STM16 EH 100 GHz card provides one SDH STM-16 port compliant with ITU-T G.692, ITU-T G.707, ITU-T G.957, and ITU-T G.958. The interface operates at 2.488 Gbps over a single-mode fiber span. Each card supports concatenated or nonconcatenated payloads at STM-1, STM-4, or STM-16 signal levels on a per VC-4 basis. [Figure 4-15](#) shows the OC48 ELR/STM16 EH 100 GHz faceplate.

**Figure 4-15** OC48 ELR/STM16 EH 100 GHz Faceplate

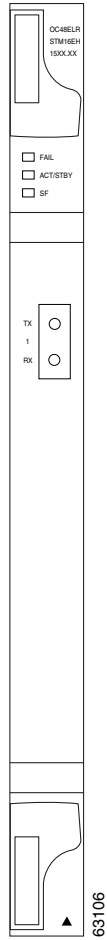
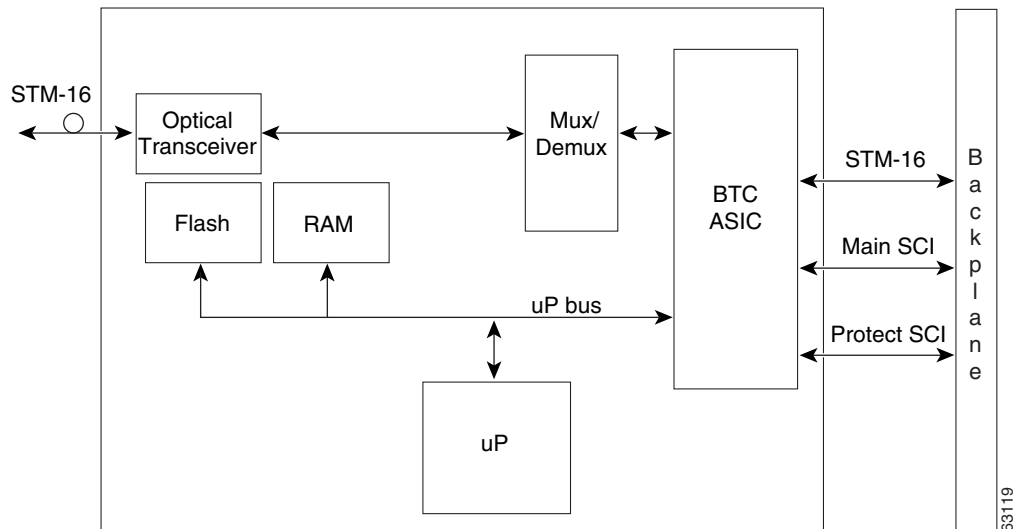


Figure 4-16 shows a block diagram of the card.

**Figure 4-16 OC48 ELR/STM16 EH 100 GHz Block Diagram**



## 4.10.1 OC48 ELR/STM16 EH 100 GHz Card Functionality

You can install the OC48 ELR/STM16 EH 100 GHz cards in Slot 5, 6, 12, or 13. You can provision this card as part of a MS-SPRing or SNCP. In an ADM/TM configuration, you can provision the card as either an access tributary or a transport span interface.

Nine of the cards operate in the blue band with a spacing of  $2 * 100$  GHz in the ITU grid (1530.33 nm, 1531.90 nm, 1533.47 nm, 1535.04 nm, 1536.61 nm, 1538.19 nm, 1539.77 nm, 1541.35 nm, and 1542.94 nm). The other nine cards operate in the red band with a spacing of  $2 * 100$  GHz in the ITU grid (1547.72 nm, 1549.32 nm, 1550.92 nm, 1552.52 nm, 1554.13 nm, 1555.75 nm, 1557.36 nm, 1558.98 nm, and 1560.61 nm).

Each OC48 ELR/STM16 EH 100 GHz card uses extended long-reach optics operating individually within the ITU 100-GHz grid. The OC48 ELR/STM16 EH 100 GHz cards are intended to be used in applications with long unregenerated spans of up to 200 km (with mid-span amplification). These transmission distances are achieved through the use of inexpensive optical amplifiers (flat gain amplifiers) such as erbium-doped fiber amplifiers (EDFAs). Using collocated amplification, distances up to 200 km can be achieved for a single channel (160 km for 8 channels).

Maximum system reach in filterless applications is 24 dB, or approximately 80 km, without the use of optical amplifiers or regenerators. However, system reach also depends on the condition of the facilities, number of splices and connectors, and other performance-affecting factors. The OC48 ELR/STM16 EH 100 GHz cards feature wavelength stability of  $\pm 0.25$  nm. Each port contains a transmitter and a receiver.

The OC48 ELR/STM16 EH 100 GHz cards are the first in a family of cards meant to support extended long-reach applications in conjunction with optical amplification. Using DFB laser technology, the OC48 ELR/STM16 EH 100 GHz cards provide a solution at the lower extended long-reach distances.



The OC48 ELR/STM16 EH 100 GHz port features a 1550-nm range laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses SC connectors and supports 1+1 unidirectional and bidirectional protection switching.

The OC48 ELR/STM16 EH 100 GHz cards detect LOS, LOF, LOP, MS-AIS, and MS-FERF conditions. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The cards also count section and line BIP errors.

To enable an MSP-SPRing, the OC48 ELR/STM16 EH 100 GHz cards extract the K1 and K2 bytes from the SDH overhead. The GCC bytes are forwarded to the TCC2/TCC2P card; the TCC2/TCC2P terminates the GCC.

## 4.10.2 OC48 ELR/STM16 EH 100 GHz Card-Level Indicators

Table 4-11 describes the three card-level LED indicators on the OC48 ELR/STM16 EH 100 GHz cards.

**Table 4-11** OC48 ELR Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
Green/Amber ACT LED	The green ACT LED indicates that the card is carrying traffic or is traffic-ready. The amber ACT LED indicates that the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## 4.10.3 OC48 ELR/STM16 EH 100 GHz Port-Level Indicators

You can find the status of the OC48 ELR/STM16 EH 100 GHz card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.11 OC192 SR/STM64 IO 1310 Card

The OC192 SR/STM64 IO 1310 card provides one intra-office haul, ITU-T G.707- and G.957-compliant, SDH STM-64 port per card in the 1310-nm wavelength range. The port operates at 9.95328 Gbps over unamplified distances up to 2 km (1.24 miles). The card supports concatenated or nonconcatenated payloads on a VC-4 basis, as well as VC-4, VC-3, and VC-12 payloads. Figure 4-17 shows the OC192 SR/STM64 IO 1310 faceplate.

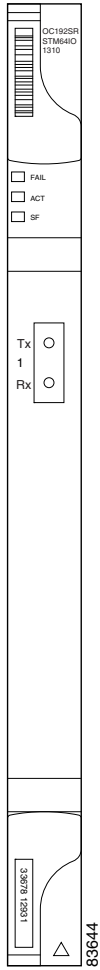
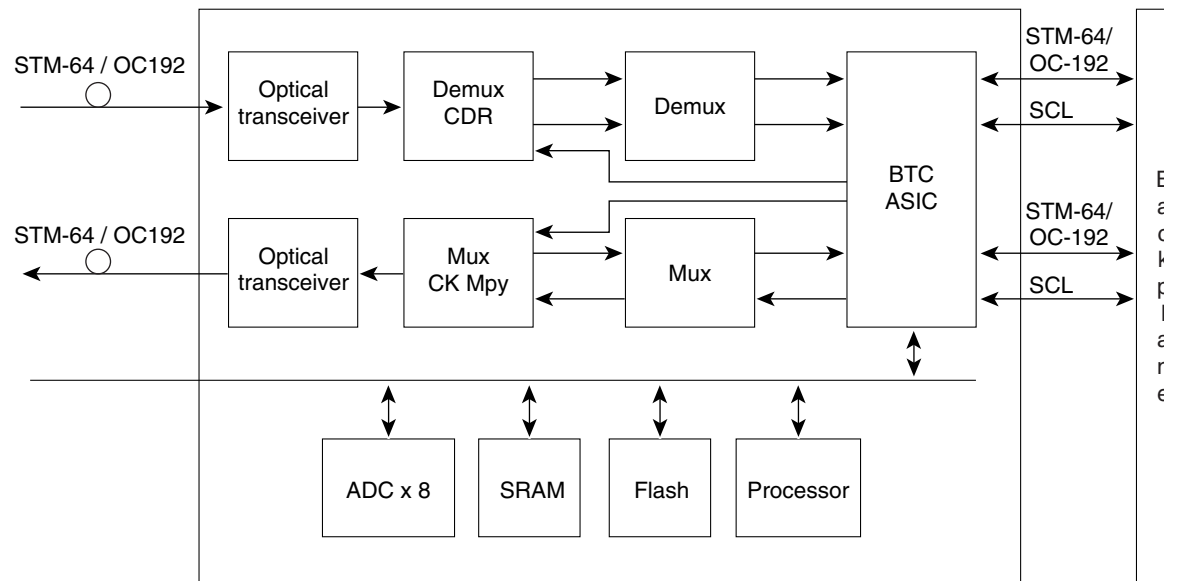
**Figure 4-17** OC192 SR/STM64 IO 1310 Faceplate

Figure 4-18 shows a block diagram of the card.

**Figure 4-18 OC192 SR/STM64 IO 1310 Block Diagram**



## 4.11.1 OC192 SR/STM64 IO 1310 Card Functionality

You can install OC192 SR/STM64 IO 1310 cards in Slot 5, 6, 12, or 13. You can provision this card as part of an MS-SPRing, a SNCP, a linear configuration, or a regenerator for longer span reaches.

The OC192 SR/STM64 IO 1310 port features a 1310-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses a dual SC connector for optical cable termination. The card supports 1+1 unidirectional and bidirectional facility protection. It also supports 1:1 protection in four-fiber bidirectional line switched ring applications where both span switching and ring switching might occur.

The OC192 SR/STM64 IO 1310 card detects SF, LOS, or LOF conditions on the optical facility. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors from B1 and B2 byte registers in the section and line overhead.

## 4.11.2 OC192 SR/STM64 IO 1310 Card-Level Indicators

Table 4-12 describes the three card-level LED indicators on the OC192 SR/STM64 IO 1310 card.

**Table 4-12 OC192 SR/STM64 IO 1310 Card-Level Indicators**

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	If the ACT/STBY LED is green, the card is operational and ready to carry traffic. The amber ACT LED indicates that the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

### 4.11.3 OC192 SR/STM64 IO 1310 Port-Level Indicators

You can find the status of the OC192 SR/STM64 IO 1310 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.12 OC192 IR/STM64 SH 1550 Card

The OC192 IR/STM64 SH 1550 card provides one short-range, ITU-T G.707- and G.957-compliant, SDH STM-64 port per card. The port operates at 9.95328 Gbps over unamplified distances up to 40 km with SMF-28 fiber limited by loss and/or dispersion. The card supports concatenated or nonconcatenated payloads on a VC-4 basis, as well as VC-4, VC-3, and VC-12 payloads.



#### Caution

You must use a 3 to 15 dB fiber attenuator (5 dB recommended) when working with the OC192 IR/STM64 SH 1550 card in a loopback. Do not use fiber loopbacks with the OC192 IR/STM64 SH 1550 card. Using fiber loopbacks can cause irreparable damage to the OC192 IR/STM64 SH 1550 card.

Figure 4-19 shows the OC192 IR/STM64 SH 1550 faceplate.

**Figure 4-19** OC192 IR/STM64 SH 1550 Faceplate

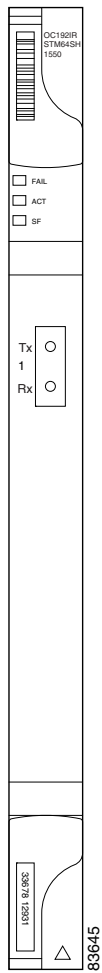
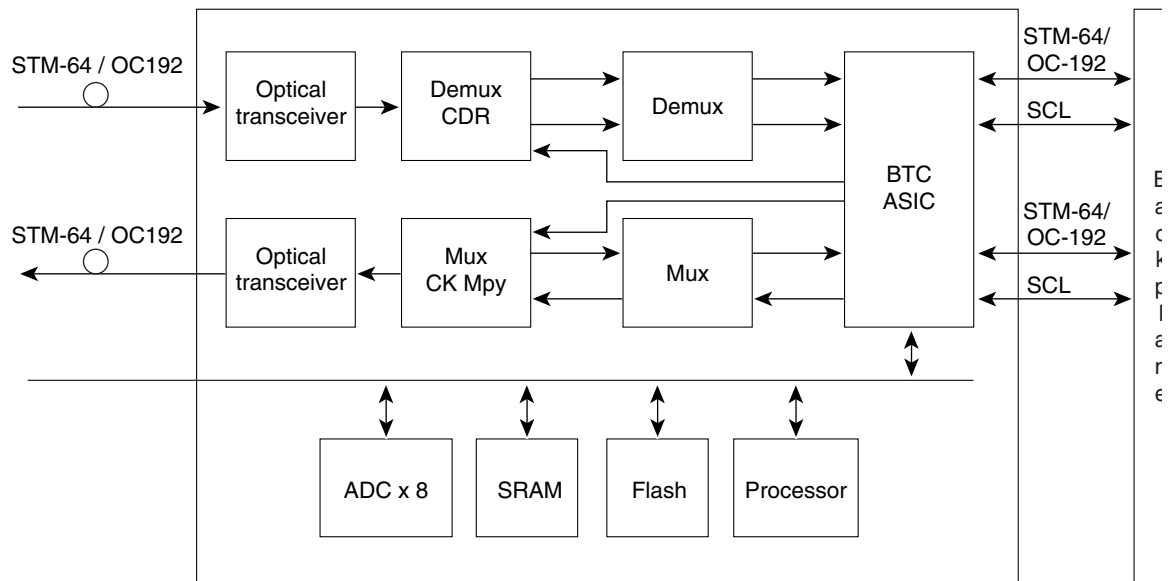


Figure 4-20 shows a block diagram of the card.

**Figure 4-20** OC192 IR/STM64 SH 1550 Block Diagram



## 4.12.1 OC192 IR/STM64 SH 1550 Card Functionality

You can install OC192 IR/STM64 SH 1550 cards in Slot 5, 6, 12, or 13. You can provision this card as part of an MS-SPRing, SNCP, or linear configuration, or as a regenerator for longer span reaches.

The OC192 IR/STM64 SH 1550 port features a 1550-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses a dual SC connector for optical cable termination. The card supports 1+1 unidirectional and bidirectional facility protection. It also supports 1:1 protection in four-fiber bidirectional line switched ring applications where both span switching and ring switching might occur.

The OC192 IR/STM64 SH 1550 card detects SF, LOS, or LOF conditions on the optical facility. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors from B1 and B2 byte registers in the section and line overhead.

## 4.12.2 OC192 IR/STM64 SH 1550 Card-Level Indicators

Table 4-13 describes the three card-level LED indicators on the OC192 IR/STM64 SH 1550 card.

**Table 4-13** OC192 IR/STM64 SH 1550 Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	If the ACT/STBY LED is green, the card is operational and ready to carry traffic. The amber ACT/STBY LED indicates that the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## 4.12.3 OC192 IR/STM64 SH 1550 Port-Level Indicators

You can find the status of the OC192 IR/STM64 SH 1550 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 4.13 OC192 LR/STM64 LH 1550 Card

The OC192 LR/STM64 LH 1550 card provides one long-range SDH STM-64 port per card, compliant with ITU-T G.707 and G.957, and Telcordia GR-253-CORE (except minimum and maximum transmit power, and minimum receive power). Also, the port is compliant to ITU-T G.691 (prepublished unedited version 10/2000) L-64.2, except for optical output power and receiver sensitivity (see Note on page 4-38). The port operates at 9.95328 Gbps over unamplified distances up to 80 km with different types of fiber such as C-SMF or dispersion compensated fiber limited by loss and/or dispersion. The card supports concatenated or nonconcatenated payloads on a VC-4 basis, as well as VC-4, VC-3, and VC-12 payloads.

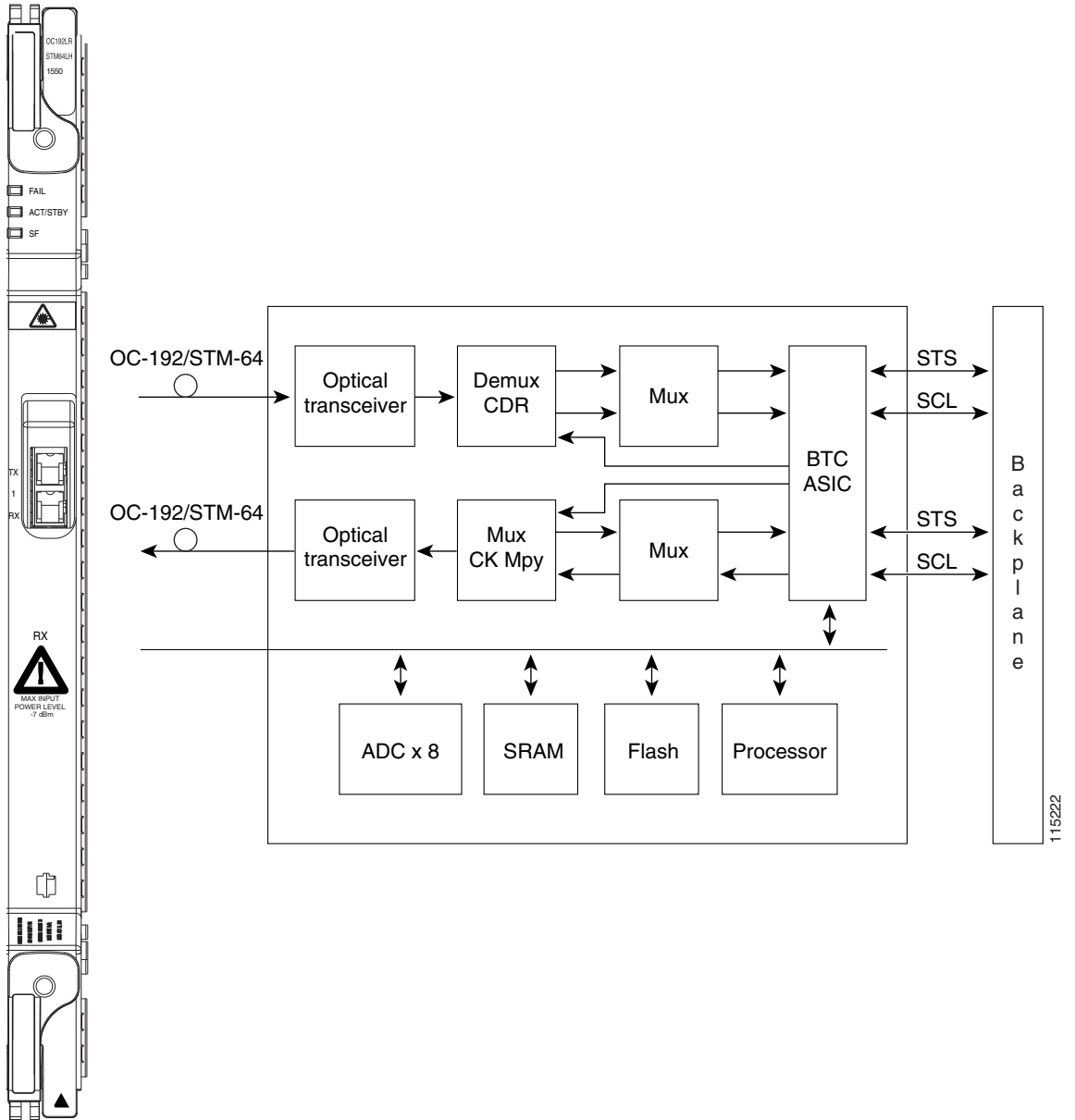
Figure 4-21 shows the OC192 LR/STM64 LH 1550 faceplate and a block diagram of the card. Figure 4-22 on page 4-37 shows an enlarged view of the faceplate warning.



**Note**

You can differentiate this OC-192/STM-64 card (15454E-L64.2-1) from the OC-192/STM-64 card with the product ID 15454-OC192LR1550 by looking at the faceplate. This card does not have a laser on/off switch.

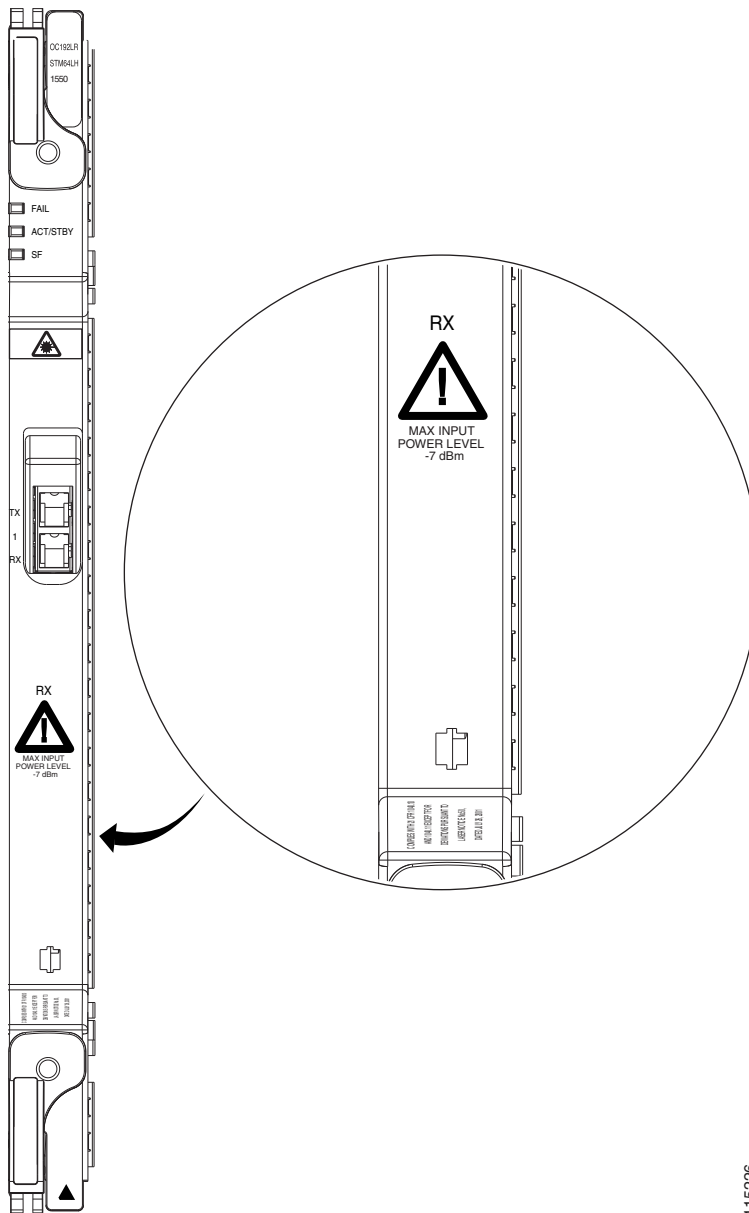
Figure 4-21 OC192 LR/STM64 LH 1550 Faceplate and Block Diagram



115222



**Figure 4-22** Enlarged Section of the OC192 LR/STM64 LH 1550 Faceplate



115226

## 4.13.1 OC192 LR/STM64 LH 1550 Card Functionality

You can install OC192 LR/STM64 LH 1550 cards in Slot 5, 6, 12, or 13. You can provision this card as part of an MS-SPRing, SNCP, or linear configuration, or also as a regenerator for longer span reaches.

The OC192 LR/STM64 LH 1550 port features a 1550-nm laser and contains a transmit and receive connector (labeled) on the card faceplate. The card uses a dual SC connector for optical cable termination. The card supports 1+1 unidirectional and bidirectional facility protection. It also supports 1:1 protection in four-fiber bidirectional line switched ring applications where both span switching and ring switching might occur.

The OC192 LR/STM64 LH 1550 card detects SF, LOS, or LOF conditions on the optical facility. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors from B1 and B2 byte registers in the section and line overhead.

**Caution**

You must use a 20-dB fiber attenuator (19 to 24 dB) when working with the OC192 LR/STM64 LH 1550 card in a loopback. Do not use fiber loopbacks with the OC192 LR/STM64 LH 1550 card. Using fiber loopbacks causes irreparable damage to the OC192 LR/STM64 LH 1550 card.

## 4.13.2 OC192 LR/STM64 LH 1550 Card-Level Indicators

Table 4-14 describes the three card-level LED indicators on the OC192 LR/STM64 LH 1550 card.

**Table 4-14** OC192 LR/STM64 LH 1550 Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	If the ACT/STBY LED is green, the card is operational and ready to carry traffic. If the ACT/STBY LED is amber, the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## 4.13.3 OC192 LR/STM64 LH 1550 Port-Level Indicators

You can find the status of the OC192 LR/STM64 LH 1550 card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

**Note**

The optical output power of the OC192 LR/STM64 LH 1550 (+4 dBm to +7 dBm) is 6 dB lower than in L-64.2b of the 10/2000 prepublished unedited version of ITU-T G.691 (+10 dBm to +13 dBm). However, the total attenuation range of the optical path, 22 to 16 dB, is maintained by the optical receiver sensitivity range of the OC192 LR/STM64 LH 1550 (-7 dBm to -24 dBm). This sensitivity range outperforms the specification in L-64.2b of the 10/2000 prepublished unedited version of ITU-T G.691 as the resulting link budget of the card is 26 dBm.

## 4.14 OC192 LR/STM64 LH ITU 15xx.xx Card

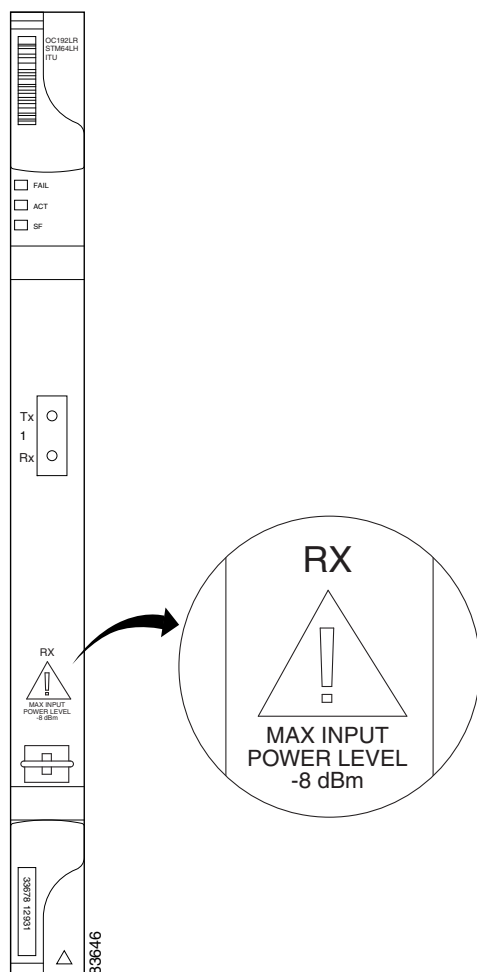
Sixteen distinct STM-64 ITU 100 GHz DWDM cards comprise the ONS 15454 SDH DWDM channel plan. The OC192 LR/STM64 LH ITU 15xx.xx card provides one long-range SDH STM-64 port per card, compliant with ITU-T G.707 and G.957, and Telcordia GR-253-CORE (except minimum and maximum transmit power, and minimum receive power). The port operates at 9.95328 Gbps over unamplified distances up to 60 km with different types of fiber such as C-SMF or dispersion compensated fiber limited by loss and/or dispersion.


**Note**

Longer distances are possible in an amplified system using dispersion compensation.

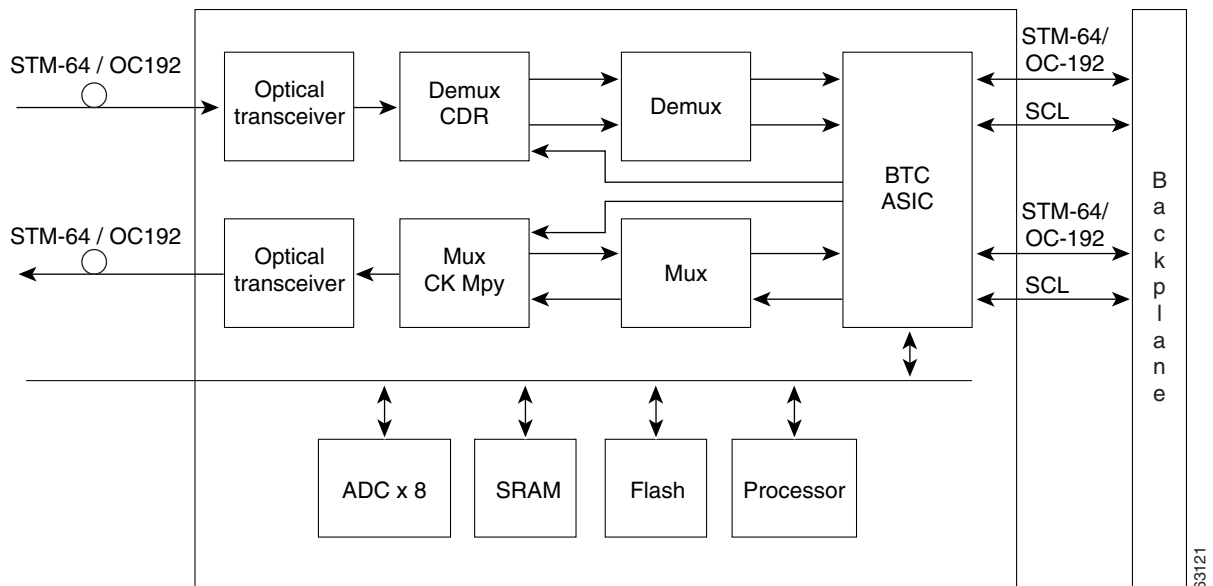
The card supports concatenated or nonconcatenated payloads on a VC-4 basis, as well as VC-4, VC-3, and VC-12 payloads. [Figure 4-23](#) shows the OC192 LR/STM64 LH ITU 15xx.xx faceplate.

**Figure 4-23** OC192 LR/STM64 LH ITU 15xx.xx Faceplate



[Figure 4-24 on page 4-40](#) shows a block diagram of the card.

Figure 4-24 OC192 LR/STM64 LH ITU 15xx.xx Block Diagram



## 4.14.1 OC192 LR/STM64 LH ITU 15xx.xx Card Functionality

You can install OC192 LR/STM64 LH ITU 15xx.xx cards in Slot 5, 6, 12, or 13. You can provision this card as part of an MS-SPRing, SNCP, or linear configuration, or as a regenerator for longer span reaches.

Eight of the OC192 LR/STM64 LH ITU 15xx.xx cards operate in the blue band with a spacing of 100 GHz in the ITU grid (1534.25 nm, 1535.04 nm, 1535.82 nm, 1536.61 nm, 1538.19 nm, 1538.98 nm, 1539.77 nm, and 1540.56 nm). The other eight cards operate in the red band with a spacing of 100 GHz in the ITU grid (1550.12 nm, 1550.92 nm, 1551.72 nm, 1552.52 nm, 1554.13 nm, 1554.94 nm, 1555.75 nm, and 1556.55 nm).

The OC192 LR/STM64 LH ITU 15xx.xx port features a laser on a specific wavelength in the 1550-nm range and contains a transmit and receive connector (labeled) on the card faceplate. The card uses a dual SC connector for optical cable termination. The card supports 1+1 unidirectional and bidirectional facility protection. It also supports 1:1 protection in four-fiber BLSR applications where both span switching and ring switching might occur.

The OC192 LR/STM64 LH ITU 15xx.xx card detects SF, LOS, or LOF conditions on the optical facility. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a description of these conditions. The card also counts section and line BIP errors from B1 and B2 byte registers in the section and line overhead.

## 4.14.2 OC192 LR/STM64 LH ITU 15xx.xx Card-Level Indicators

Table 4-15 describes the three card-level LED indicators on the OC192 LR/STM64 LH ITU 15xx.xx card.

**Table 4-15** OC192 LR/STM64 LH ITU 15xx.xx Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. The FAIL LED is on during reset and flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	If the ACT/STBY LED is green, the card is operational and ready to carry traffic. If the ACT/STBY LED is amber, the card is in standby mode or is part of an active ring switch (BLSR).
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card's ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## 4.14.3 OC192 LR/STM64 LH ITU 15xx.xx Port-Level Indicators

You can find the status of the OC192 LR/STM64 LH ITU 15xx.xx card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.





## Ethernet Cards

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### Note

The terms “Unidirectional Path Switched Ring” and “UPSR” may appear in Cisco literature. These terms do not refer to using Cisco ONS 15xxx products in a unidirectional path switched ring configuration. Rather, these terms, as well as “Path Protected Mesh Network” and “PPMN,” refer generally to Cisco’s path protection feature, which may be used in any topological network configuration. Cisco does not recommend using its path protection feature in any particular topological network configuration.

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The Cisco ONS 15454 SDH integrates Ethernet into a SDH time-division multiplexing (TDM) platform. This chapter describes the Cisco ONS 15454 SDH E-Series Ethernet cards, G-Series Ethernet cards, and ML-Series Ethernet cards. It includes descriptions, hardware specifications, and block diagrams for each card. For G-Series and E-Series Ethernet application information, see [Chapter 14, “Ethernet Operation.”](#) For installation and card turn-up procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*. For ML-Series configuration information, see the *Ethernet Card Software Feature and Configuration Guide*.

Chapter topics include:

- [5.1 Ethernet Card Overview, page 5-1](#)
- [5.2 E100T-G Card, page 5-2](#)
- [5.3 E1000-2-G Card, page 5-4](#)
- [5.4 G1000-4 Card, page 5-7](#)
- [5.5 G1K-4 Card, page 5-8](#)
- [5.6 ML100T-12 Card, page 5-10](#)
- [5.7 ML1000-2 Card, page 5-12](#)
- [5.8 GBICs and SFPs, page 5-14](#)

## 5.1 Ethernet Card Overview

The card overview section summarizes card functions, power consumption, and temperature ranges.



### Note

Each card is marked with a symbol that corresponds to a slot (or slots) on the ONS 15454 SDH shelf assembly. The cards are then installed into slots displaying the same symbols. See the *Cisco ONS 15454 SDH Procedures Guide* for a list of slots and symbols.

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## 5.1.1 Cards Summary

Table 5-1 lists the Cisco ONS 15454 SDH Ethernet cards.

**Table 5-1 Ethernet Cards for the ONS 15454 SDH**

Card	Port Description	For Additional Information...
E100T-G	The E100T-G card provides 12 switched, autosensing, 10/100BaseT Ethernet ports.	See the “5.2 E100T-G Card” section on page 5-2.
E1000-2-G	The E1000-2-G card provides two IEEE-compliant, 1000-Mbps ports. Gigabit Interface Converters (GBICs) are separate.	See the “5.3 E1000-2-G Card” section on page 5-4.
G1000-4	The G1000-4 card provides four IEEE-compliant, 1000-Mbps ports. GBICs are separate.	See the “5.4 G1000-4 Card” section on page 5-7.
G1K-4	The G1K-4 card provides four IEEE-compliant, 1000-Mbps ports. GBICs are separate. The G1K-4 card is functionally identical to the G1000-4 card.	See the “5.5 G1K-4 Card” section on page 5-8.
ML100T-12	The ML100T-12 card provides 12 switched, autosensing, 10/100Base-T Ethernet ports.	See the “5.6 ML100T-12 Card” section on page 5-10.
ML1000-2	The ML1000-2 card provides two IEEE-compliant, 1000-Mbps ports. Small form-factor pluggable (SFP) connectors are separate.	See the “5.7 ML1000-2 Card” section on page 5-12.

## 5.1.2 Card Compatibility

Table 5-2 lists the CTC software compatibility for each Ethernet card. See Table 2-6 on page 2-4 to determine Ethernet card cross-connect compatibility.

**Table 5-2 Ethernet Card Software Compatibility**

Ethernet Cards	R2.2.1	R2.2.2	R3.0.1	R3.1	R3.2	R3.3	R3.4	R4.0	R4.1	R4.5 <sup>1</sup>	R4.6	R4.7 <sup>1</sup>	R5.0
E100T-G	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
E1000-2-G	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
G1000-4	—	—	—	—	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
G1K-4	—	—	—	—	Yes	Yes	Yes	Yes	Yes	—	Yes	—	Yes
ML100T-12	—	—	—	—	—	—	—	Yes	Yes	—	Yes	—	Yes
ML1000-2	—	—	—	—	—	—	—	Yes	Yes	—	Yes	—	Yes

1. DWDM-only release.

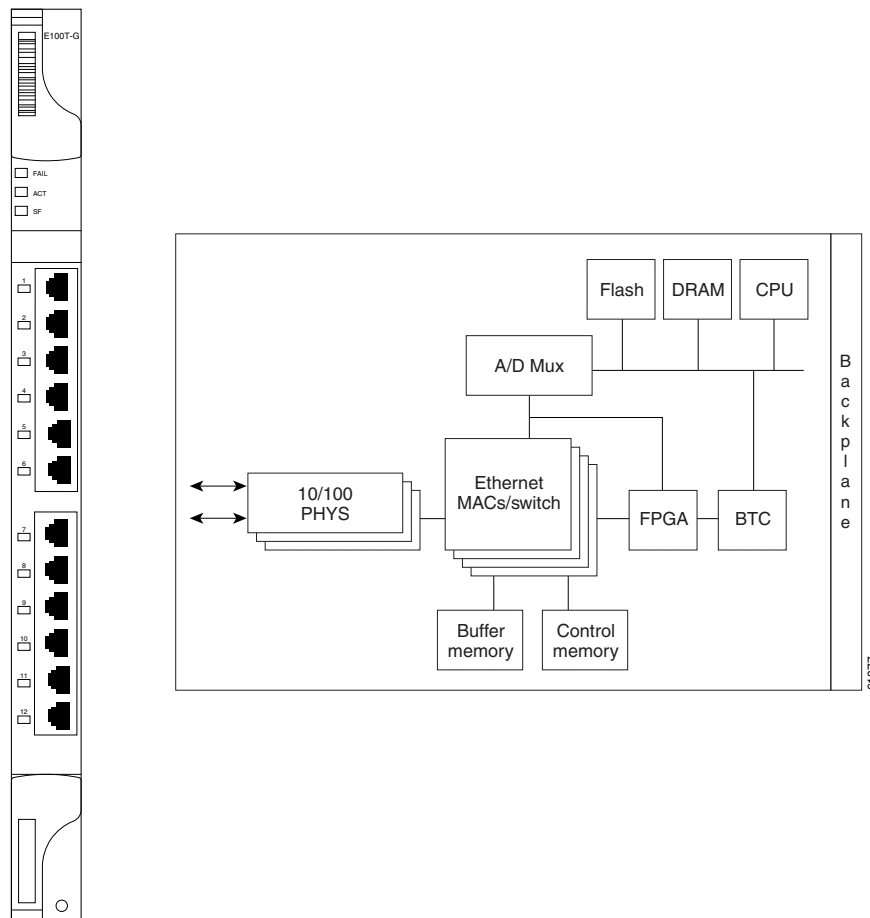
## 5.2 E100T-G Card

The ONS 15454 SDH uses E100T-G cards for Ethernet (10 Mbps) and Fast Ethernet (100 Mbps). Each card provides 12 switched, IEEE 802.3-compliant, 10/100BaseT Ethernet ports that can independently detect the speed of an attached device (autosense) and automatically connect at the appropriate speed.



The ports autoconfigure to operate at either half or full duplex and determine whether to enable or disable flow control. You can also configure Ethernet ports manually. Figure 5-1 shows the faceplate and a block diagram of the card.

**Figure 5-1** E100T-G Faceplate and Block Diagram



The E100T-G Ethernet card provides high-throughput, low-latency packet switching of Ethernet traffic across a SDH network while providing a greater degree of reliability through SDH self-healing protection services. This Ethernet capability enables network operators to provide multiple 10/100-Mbps access drops for high-capacity customer LAN interconnects, Internet traffic, and cable modem traffic aggregation. It enables the efficient transport and co-existence of traditional TDM traffic with packet-switched data traffic.

Each E100T-G card supports standards-based, wire-speed, Layer 2 Ethernet switching between its Ethernet interfaces. The IEEE 802.1Q tag logically isolates traffic (typically subscribers). IEEE 802.1Q also supports multiple classes of service.

## 5.2.1 E100T-G Slot Compatibility

You can install the E100T-G card in Slots 1 to 6 and 12 to 17. Multiple E-Series Ethernet cards installed in an ONS 15454 SDH can act independently or as a single Ethernet switch. You can create logical SDH ports by provisioning a number of SDH channels to the packet switch entity within the ONS 15454 SDH. Logical ports can be created with a bandwidth granularity of VC-4.

## 5.2.2 E100T-G Card-Level Indicators

The E100T-G card faceplate has three card-level LED indicators (Table 5-3).

**Table 5-3** E100T-G Card-Level Indicators

Card-Level Indicators	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the E100T-G card. As part of the boot sequence, the FAIL LED is turned on until the software deems the card operational.
Green ACT LED	A green ACT LED provides the operational status of the E100T-G. If the ACT LED is green, it indicates that the E100T-G card is active and the software is operational.
SF LED	Not used.

## 5.2.3 E100T-G Port-Level Indicators

The E100T-G card also has 12 pairs of LEDs (one pair for each port) to indicate port conditions (Table 5-4). You can find the status of the E100T-G card port using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

**Table 5-4** E100T-G Port-Level Indicators

LED State	Description
Amber	Port is active (transmitting and/or receiving data). By default, indicates the transmitter is active but can be software controlled to indicate link status, duplex status, or receiver active.
Solid Green	Link is established. By default, indicates the link for this port is up, but can be software controlled to indicate duplex status, operating speed, or collision.

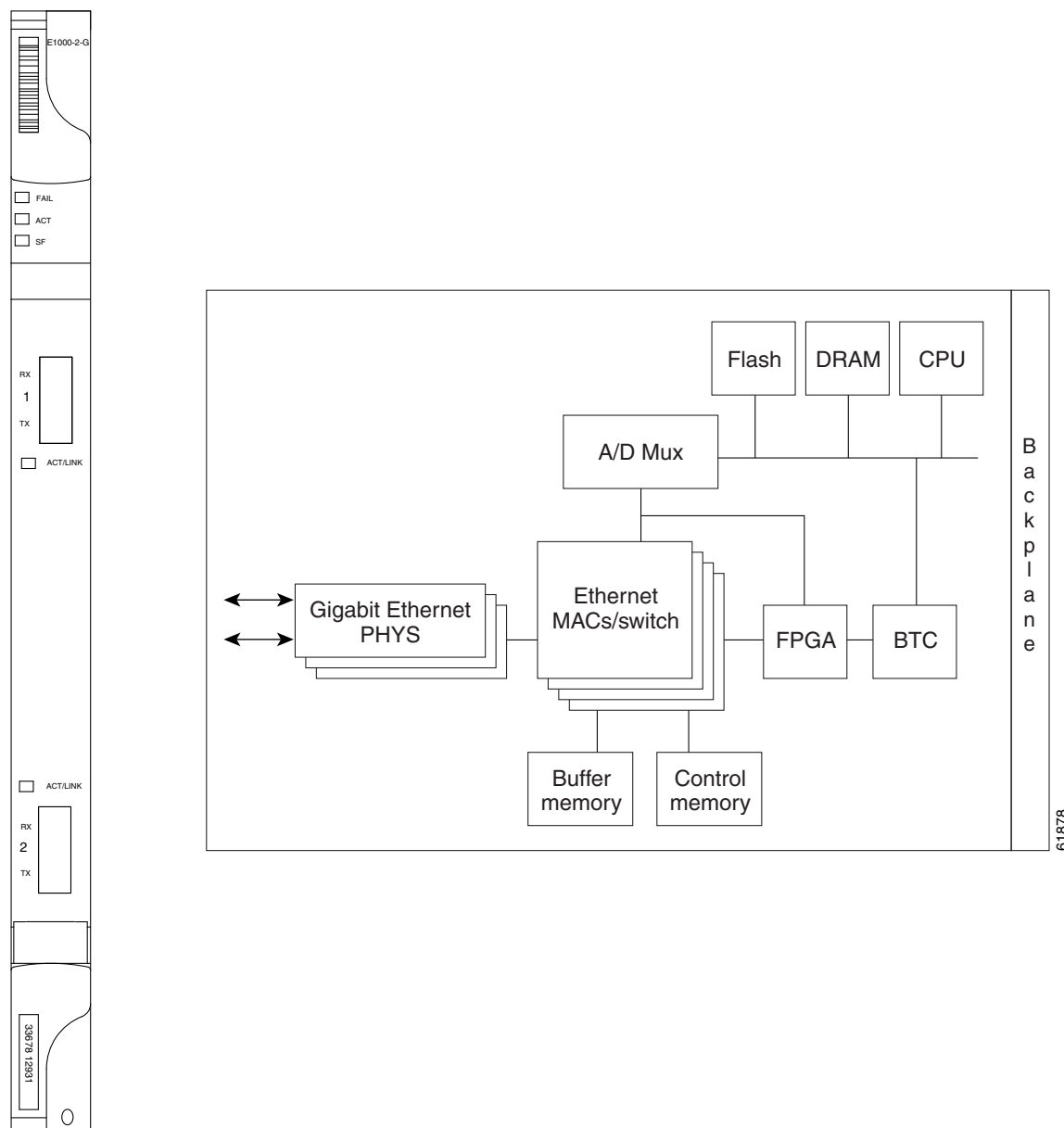
## 5.3 E1000-2-G Card

The ONS 15454 SDH uses E1000-2-G cards for Gigabit Ethernet (1000 Mbps). The E1000-2-G card provides two IEEE-compliant, 1000-Mbps ports for high-capacity customer LAN interconnections. Each port supports full-duplex operation.

The E1000-2-G card uses GBIC modular receptacles for the optical interfaces. For details, see the “5.8 GBICs and SFPs” section on page 5-14.

Figure 5-2 shows the card faceplate and a block diagram of the card.

**Figure 5-2 E1000-2-G Faceplate and Block Diagram**



The E1000-2-G Gigabit Ethernet card provides high-throughput, low-latency packet switching of Ethernet traffic across a SDH network while providing a greater degree of reliability through SDH self-healing protection services. This enables network operators to provide multiple 1000-Mbps access drops for high-capacity customer LAN interconnects. It enables efficient transport and co-existence of traditional TDM traffic with packet-switched data traffic.

Each E1000-2-G card supports standards-based, Layer 2 Ethernet switching between its Ethernet interfaces and SDH interfaces on the ONS 15454 SDH. The IEEE 802.1Q VLAN tag logically isolates traffic (typically subscribers).

Multiple E-Series Ethernet cards installed in an ONS 15454 SDH can act together as a single switching entity or as independent single switches supporting a variety of SDH port configurations.

You can create logical SDH ports by provisioning a number of SDH channels to the packet switch entity within the ONS 15454 SDH. Logical ports can be created with a bandwidth granularity of VC-4.

## 5.3.1 E1000-2-G Compatibility

The E1000-2-G is compatible with any traffic card slots (Slots 1 to 6 and 12 to 17).

## 5.3.2 E1000-2-G Card-Level Indicators

The E1000-2-G card faceplate has three card-level LED indicators ([Table 5-5](#)).

**Table 5-5** E1000-2-G Card-Level Indicators

Card-Level Indicators	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the E1000-2-G card. As part of the boot sequence, the FAIL LED is turned on until the software deems the card operational.
Green ACT LED	A green ACT LED provides the operational status of the E1000-2-G. If the ACT LED is green it indicates that the E1000-2-G card is active and the software is operational.
SF LED	Not used in this release.

## 5.3.3 E1000-2-G Port-Level Indicators

The E1000-2-G card also has one bicolor LED per port ([Table 5-6](#)). When the LINK LED is illuminated green, carrier is detected, meaning an active network cable is installed. When the LINK LED is not illuminated green, an active network cable is not plugged into the port, or the card is carrying unidirectional traffic. The port ACT LED flashes amber at a rate proportional to the level of traffic being received and transmitted over the port.

**Table 5-6** E1000-2-G Port-Level Indicators

LED State	Description
Amber	The port is active (transmitting and receiving data).
Solid green	The link is established.
Green light off	The connection is inactive, or traffic is unidirectional.

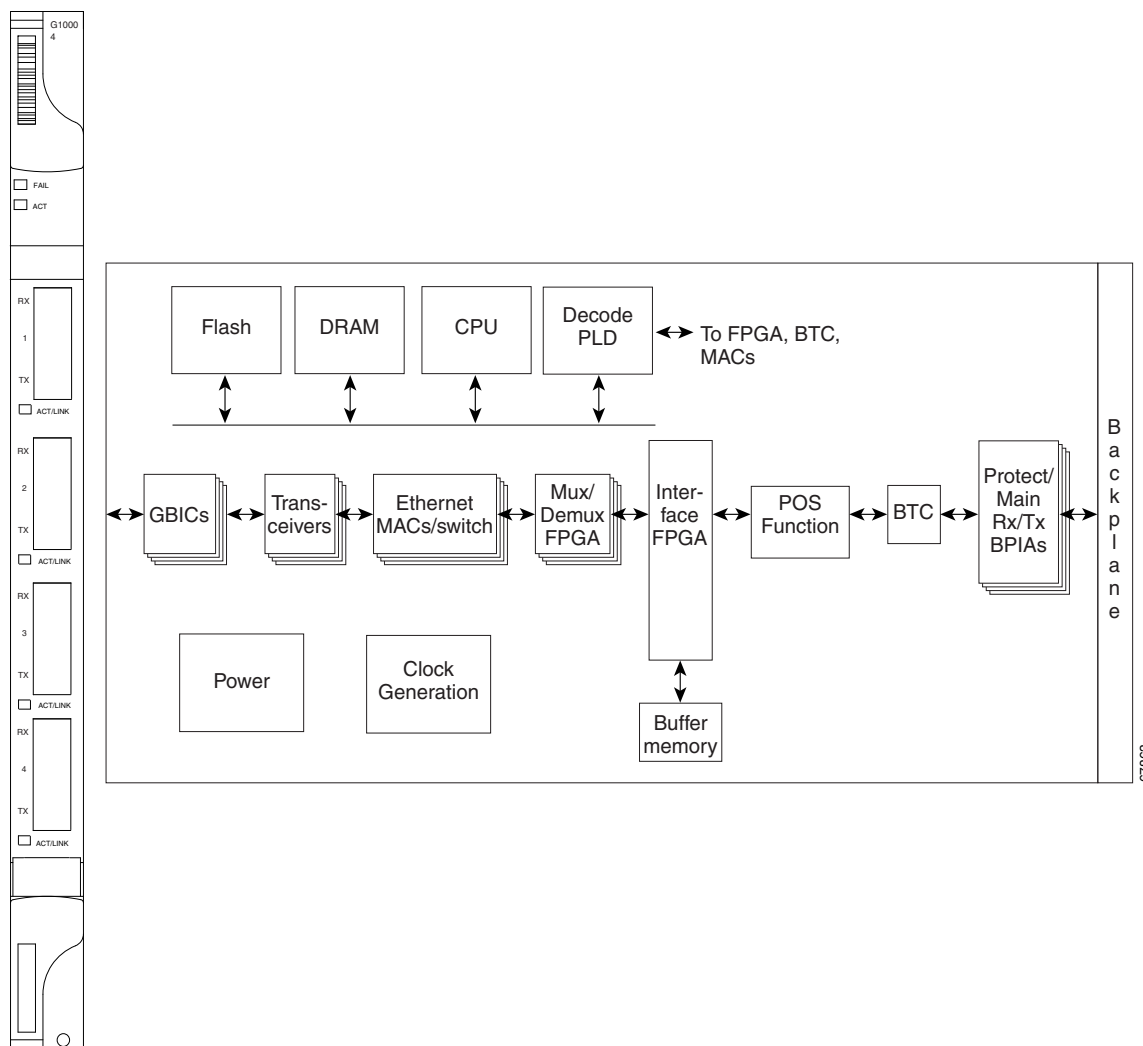
## 5.4 G1000-4 Card

The ONS 15454 SDH uses G1000-4 cards for Gigabit Ethernet (1000 Mbps). The G1000-4 card provides four ports of IEEE-compliant, 1000-Mbps interfaces. Each port supports full-duplex operation for a maximum bandwidth of STM-16 on each card.

The G1000-4 card uses GBIC modular receptacles for the optical interfaces. For details, see the “5.8 GBICs and SFPs” section on page 5-14.

Figure 5-3 shows the card faceplate and the block diagram of the card.

**Figure 5-3** G1000-4 Faceplate and Block Diagram



The G1000-4 Gigabit Ethernet card provides high-throughput, low latency transport of Ethernet encapsulated traffic (IP and other Layer 3 protocols) across a SDH network. Carrier-class Ethernet transport is achieved by hitless (< 50 ms) performance in the event of any failures or protection switches (such as 1+1 automatic protection switching [APS], SNCP ring, or MS-SPRing. Full provisioning support is possible via Cisco Transport Controller (CTC) or Cisco Transport Manager (CTM). Each G1000-4 card performs independently of the other cards in the same shelf.

## 5.4.1 G1000-4 Card-Level Indicators

The G1000-4 card faceplate has two card-level LED indicators ([Table 5-7](#)).

**Table 5-7** G1000-4 Card-Level Indicators

Card-Level LEDs	Description
FAIL LED (red)	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the G1000-4 card. As part of the boot sequence, the FAIL LED turns on; it turns off if the software is deemed operational. The red FAIL LED normally blinks when the card is loading software.
ACT LED (green)	A green ACT LED provides the operational status of the G1000-4. If the ACT LED is green, it indicates that the G1000-4 card is active and the software is operational.

## 5.4.2 G1000-4 Port-Level Indicators

The G1000-4 card has one bicolor LED per port. [Table 5-8](#) describes the status that each color represents.

**Table 5-8** G1000-4 Port-Level Indicators

Port-Level LED State	Description
Off	No link exists to the Ethernet port.
Steady amber	A link exists to the Ethernet port, but traffic flow is inhibited. For example, an unconfigured circuit, an error on line, or a nonenabled port might inhibit traffic flow.
Solid green	A link exists to the Ethernet port, but no traffic is carried on the port.
Flashing green	A link exists to the Ethernet port, and traffic is carried on the port. The LED flash rate reflects the traffic rate for the port.

## 5.4.3 G1000-4 Compatibility

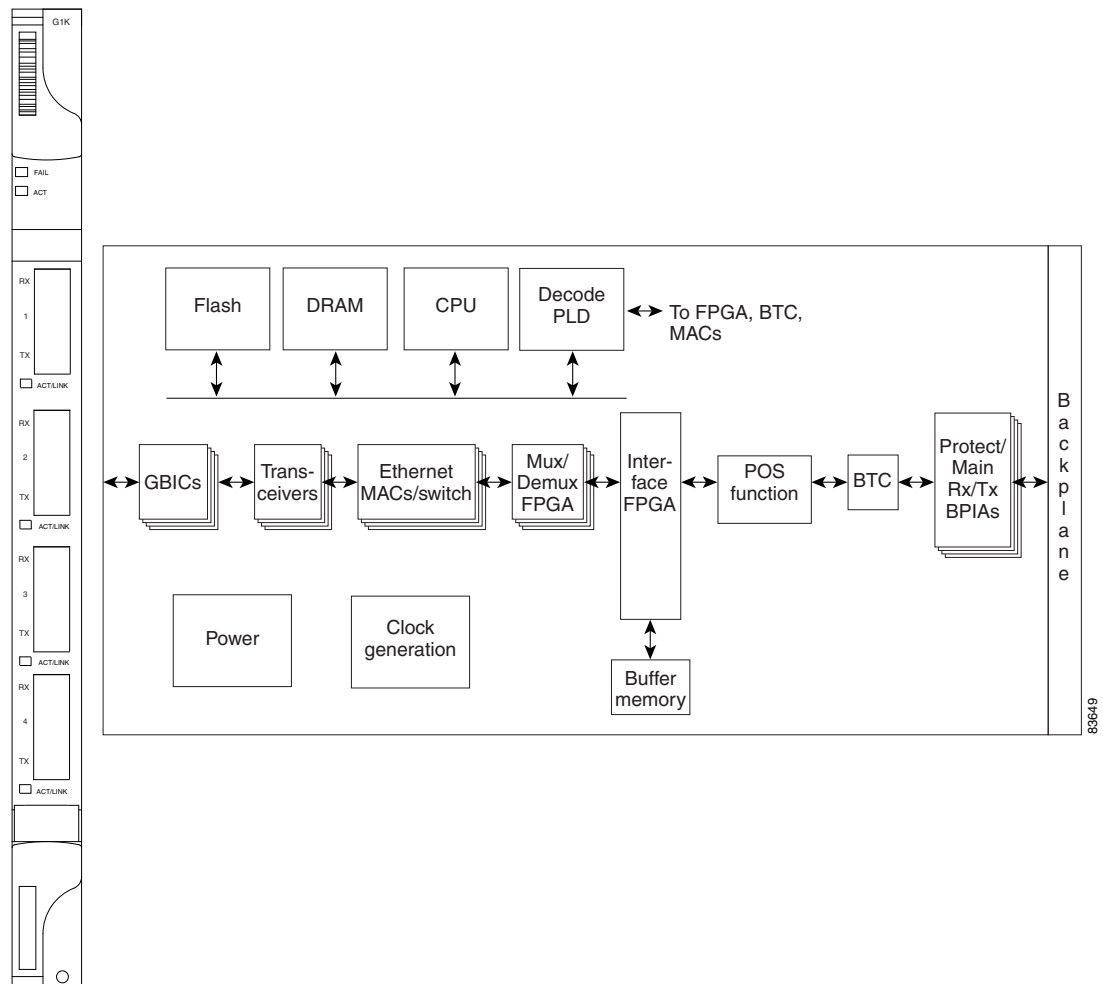
The G-Series card operates in Slots 1 to 6 and 12 to 17, for a total shelf capacity of 48 Gigabit Ethernet ports. The practical G1000-4 port per shelf limit is 40, because at least two slots are typically filled by OC-N trunk cards.

## 5.5 G1K-4 Card

The G1K-4 card is the functional equivalent of the G1000-4 card and provides four ports of IEEE-compliant, 1000-Mbps interfaces. Each interface supports full-duplex operation for a maximum bandwidth of 1 Gbps or 2 Gbps bidirectional per port, and 2.5 Gbps or 5 Gbps bidirectional per card. Each port autonegotiates for full duplex and IEEE 802.3x flow control. The G1K-4 card uses GBIC modular receptacles for the optical interfaces. For details, see the [“5.8 GBICs and SFPs”](#) section on [page 5-14](#).

Figure 5-4 shows the card faceplate and the block diagram of the card.

**Figure 5-4 G1K-4 Faceplate and Block Diagram**



The G1K-4 Gigabit Ethernet card provides high-throughput, low-latency transport of Ethernet encapsulated traffic (IP and other Layer 3 protocols) across a SDH network while providing a greater degree of reliability through SDH self-healing protection services. Carrier-class Ethernet transport is achieved by hitless (< 50 ms) performance in the event of any failures or protection switches (such as 1+1 APS, path protection, BLSR, or optical equipment protection) and full provisioning and manageability, as in SDH service. Full provisioning support is possible via CTC or CTM. Each G1K-4 card performs independently of the other cards in the same shelf.

## 5.5.1 G1K-4 Compatibility

Software R4.0 and later identifies G1K-4 cards as G1K-4s upon physical installation. Software prior to R4.0 identifies both G1000-4 and G1K-4 cards as G1000-4s upon physical installation.

You can install the G1K-4 card in Slots 1 to 6 and 12 to 17, for a total shelf capacity of 48 Gigabit Ethernet ports. (The practical limit is 40 ports because at least two slots are typically populated by optical cards such as the OC-192.)

## 5.5.2 G1K-4 Card-Level Indicators

The G1K-4 card faceplate has two card-level LED indicators, described in [Table 5-9](#).

**Table 5-9** G1K-4 Card-Level Indicators

Card-Level LEDs	Description
FAIL LED (red)	<p>The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the G1K-4 card. As part of the boot sequence, the FAIL LED is turned on, and it goes off when the software is deemed operational.</p> <p>The red FAIL LED blinks when the card is loading software.</p>
ACT LED (green)	A green ACT LED provides the operational status of the G1K-4. If the ACT LED is green, it indicates that the G1K-4 card is active and the software is operational.

## 5.5.3 G1K-4 Port-Level Indicators

The G1K-4 card has four bicolor LEDs (one LED per port). [Table 5-10](#) describes these LEDs.

**Table 5-10** G1K-4 Port-Level Indicators

Port-Level LED State	Description
Off	No link exists to the Ethernet port.
Steady amber	A link exists to the Ethernet port, but traffic flow is inhibited. For example, a lack of circuit setup, an error on the line, or a nonenabled port might inhibit traffic flow.
Solid green	A link exists to the Ethernet port, but no traffic is carried on the port.
Flashing green	A link exists to the Ethernet port, and traffic is carried on the port. The LED flash rate reflects the traffic rate for the port.

## 5.6 ML100T-12 Card

The ML100T-12 card provides 12 ports of IEEE 802.3-compliant, 10/100 interfaces. Each interface supports full-duplex operation for a maximum bandwidth of 200 Mbps per port and 2.488 Gbps per card. Each port independently detects the speed of an attached device (autosenses) and automatically connects at the appropriate speed. The ports autoconfigure to operate at either half or full duplex and can determine whether to enable or disable flow control. For ML-Series configuration information, see the *Cisco ONS 15454 SONET/SDH ML-Series Multilayer Ethernet Card Software Feature and Configuration Guide*.

[Figure 5-5](#) shows the card faceplate.

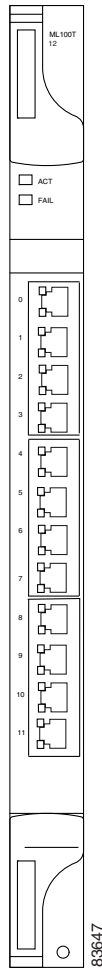


### Caution

Shielded twisted-pair cabling should be used for inter-building applications.



**Figure 5-5 ML100T-12 Faceplate**



ML-Series cards feature two SDH virtual ports with a maximum combined bandwidth of VC4-16c. Each port carries an STM circuit with a size of VC3, VC4, VC4-2c, VC4-3c, VC4-4c, and VC4-8c. For step-by-step instructions on configuring an ML-Series card SDH STM circuit, refer to the “Create Circuits and Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

The ML-Series packet-over-SDH (POS) ports supports virtual concatenation (VCAT) of SONET/SDH circuits and a software link capacity adjustment scheme (SW-LCAS). The ML-Series card supports a maximum of two VCAT groups with each group corresponding to one of the POS ports. Each VCAT group must be provisioned with two circuit members. An ML-Series card supports VC-3-2v, VC-4-2v and VC-4-4c-2v. For step-by-step instructions on configuring an ML-Series card SDH VCAT circuit, refer to the “Create Circuits and Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

## 5.6.1 ML100T-12 Card-Level Indicators

The ML00T-12 card supports two card-level LED indicators, described in [Table 5-11](#).

**Table 5-11 ML100T-12 Card-Level Indicators**

Card-Level LEDs	Description
Red SF LED	The red SF LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the ML100T-12 card. As part of the boot sequence, the FAIL LED is illuminated until the software deems the card operational.
Green ACT LED	A green ACT LED provides the operational status of the ML100T-12. If the ACT LED is green, it indicates that the ML100T-12 card is active and the software is operational.

## 5.6.2 ML100T-12 Port-Level Indicators

The ML100T-12 card provides a pair of LEDs for each Fast Ethernet port: an amber LED for activity (ACT) and a green LED for LINK. The port-level indicators are described in [Table 5-12](#).

**Table 5-12 ML100T-12 Port-Level Indicators**

Port-Level LED State	Description
ACT LED (Amber)	Steady amber LED indicates that a link is detected, but there is an issue inhibiting traffic. Blinking amber LED means that traffic is flowing.
LINK LED (Green)	Steady green LED indicates that a link is detected, but there is no traffic. Blinking green LED flashes at a rate proportional to the level of traffic being received and transmitted over the port.
Both ACT and LINK LED	Unlit green and amber LEDs indicate no traffic.

## 5.6.3 ML100T-12 Slot Compatibility

The ML100T-12 card works in Slots 1 to 6 or 12 to 17.

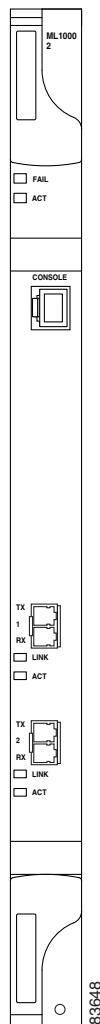
## 5.7 ML1000-2 Card

The ML1000-2 card provides two ports of IEEE-compliant, 1000-Mbps interfaces. Each interface supports full-duplex operation for a maximum bandwidth of 2 Gbps per port and 4 Gbps per card. Each port autoconfigures for full duplex and IEEE 802.3x flow control.

SFP modules are offered as separate orderable products for maximum customer flexibility. For details, see the [“5.8 GBICs and SFPs”](#) section on page 5-14.

Figure 5-6 shows the ML1000-2 card faceplate.

**Figure 5-6 ML1000-2 Faceplate**



ML-Series cards feature two SDH virtual ports with a maximum combined bandwidth of VC4-16c. Each port carries an STM circuit with a size of VC3, VC4, VC4-2c, VC4-3c, VC4-4c, and VC4-8c. For step-by-step instructions on configuring an ML-Series card SDH STM circuit, refer to the “Create Circuits and Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

The ML-Series POS ports supports VCAT of SONET/SDH circuits and a software link capacity adjustment scheme (SW-LCAS). The ML-Series card supports a maximum of two VCAT groups with each group corresponding to one of the POS ports. Each VCAT group must be provisioned with two circuit members. An ML-Series card supports VC-3-2v, VC-4-2v and VC-4-4c-2v. For step-by-step instructions on configuring an ML-Series card SDH VCAT circuit, refer to the “Create Circuits and Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

## 5.7.1 ML1000-2 Card-Level Indicators

The ML1000-2 card faceplate has two card-level LED indicators, described in [Table 5-13](#).

**Table 5-13 ML1000-2 Card-Level Indicators**

Card-Level LEDs	Description
FAIL LED (Red)	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the ML1000-2 card. As part of the boot sequence, the FAIL LED is turned on until the software deems the card operational.
ACT LED (Green)	A green ACT LED provides the operational status of the ML1000-2. When the ACT LED is green, it indicates that the ML1000-2 card is active and the software is operational.

## 5.7.2 ML1000-2 Port-Level Indicators

The ML1000-2 card has two LEDs for each of the two Gigabit Ethernet ports. The port-level indicators are described in [Table 5-14](#).

**Table 5-14 ML1000-2 Port-Level Indicators**

Port-Level LED State	Description
ACT LED (Amber)	Steady amber LED indicates that a link is detected, but there is an issue inhibiting traffic. Blinking amber LED means that traffic is flowing.
LINK LED (Green)	Steady green LED indicates that a link is detected, but there is no traffic. Blinking green LED flashes at a rate proportional to the level of traffic being received and transmitted over the port.
Both ACT and LINK LED	Unlit green and amber LEDs indicate no traffic.

## 5.7.3 ML1000-2 Slot Compatibility

The ML1000-2 card works in Slots 1 to 6 or 12 to 17.

## 5.8 GBICs and SFPs

This section describes the GBICs and SFPs used with the Ethernet cards.

The ONS 15454 SDH Ethernet cards use industry standard small form-factor pluggable connectors (SFPs) and Gigabit Interface Converter (GBIC) modular receptacles. The ML-Series Gigabit Ethernet cards use standard Cisco SFPs. The Gigabit E-Series card and the G-Series card use standard Cisco GBICs. With Software Release 4.1 and later, G-Series cards can also be equipped with dense wavelength division multiplexing (DWDM) and coarse wavelength division multiplexing (CWDM) GBICs to function as Gigabit Ethernet transponders.

For all Ethernet cards, the type of GBIC or SFP plugged into the card is displayed in CTC and TL1. Cisco offers SFPs and GBICs as separate orderable products.

## 5.8.1 Compatibility by Card

Table 5-15 lists Cisco ONS 15454 SDH Ethernet cards with their compatible GBICs and SFPs.



**Caution**

Only use GBICs and SFPs certified for use in Cisco Optical Networking Systems. The qualified Cisco GBIC and SFP pluggable module's top assembly numbers (TANs) are provided in Table 5-15.

**Table 5-15 GBIC and SFP Card Compatibility**

Card	Compatible GBIC or SFP (Cisco Product ID)	Cisco Top Assembly Number (TAN)
E1000-2-G (ONS 15454 SONET)	15454-GBIC-SX	30-0759-01
E1000-2 (ONS 15454 SONET/SDH)	15454E-GBIC-SX	800-06780-01 <sup>1</sup>
	15454-GBIC-LX/LH	10-1743-01
	15454E-GBIC-LX/LH	30-0703-01
FC_MR-4 (ONS 15454 SONET/SDH)	15454-GBIC-SX	30-0759-01
	15454E-GBIC-SX	800-06780-01
	15454-GBIC-LX/LH	10-1743-01
	15454E-GBIC-LX/LH	30-0703-01
	ONS-GX-2FC-MMI	10-2015-01
	ONS-GX-2FC-SML	10-2016-01
G1K-4 (ONS 15454 SONET/SDH)	15454-GBIC-SX	30-0759-01
G1000-4 (ONS 15454 SONET/SDH)	15454E-GBIC-SX	800-06780-01
	15454-GBIC-LX/LH	10-1743-01
	15454E-GBIC-LX/LH	30-0703-01
	15454-GBIC-ZX	30-0848-01
	15454E-GBIC-ZX	10-1744-01
	15454-GBIC-xx.x <sup>2</sup>	10-1845-01 through 10-1876-01
	15454E-GBIC-xx.x <sup>2</sup>	10-1845-01 through 10-1876-01
	15454-GBIC-xxxx <sup>3</sup>	10-1453-01 through 10-1460-01
	15454E-GBIC-xxxx <sup>3</sup>	10-1453-01 through 10-1460-01
ML1000-2 (ONS 15454 SONET/SDH)	15454-SFP-LC-SX	30-1301-01
	15454E-SFP-LC-SX	30-1301-01
	15454-SFP-LC-LX/LH	30-1299-01
	15454E-SFP-LC-LX/LH	30-1299-01

1. This TAN is only compatible with ONS 15454-E1000-2 or 15454-E1000-2-G cards.
2. xx.x defines the 32 possible wavelengths as shown in Table A-1 on page A-4.
3. xxxx defines the 8 possible wavelengths as shown in Table 5-16 on page 5-17.

## 5.8.2 GBIC Description

GBICs are integrated fiber optic transceivers that provide high speed serial links from a port or slot to the network. Various latching mechanisms can be utilized on the GBIC pluggable modules. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the GBIC for technology type and model. One GBIC model has two clips (one on each side of the GBIC) that secure the GBIC in the slot on the Ethernet card; the other has a locking handle. Both types are shown in Figure 5-7.

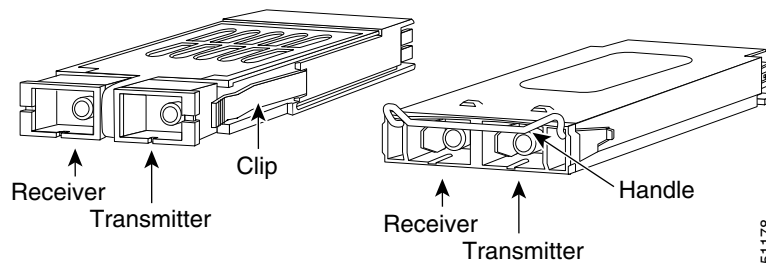
GBIC dimensions are:

- Height 0.39 in. (1 cm)
- Width 1.18 in. (3 cm)
- Depth 2.56 in. (6.5 cm)

GBIC temperature ranges are:

- COM—commercial operating temperature range -5°C to 70°C
- EXT—extended operating temperature range 0°C to 85°C
- IND—industrial operating temperature range -40°C to 85°C

**Figure 5-7 GBICs with Clips (left) and with a Handle (right)**



### 5.8.2.1 DWDM and CWDM GBICs

DWDM (15454-GBIC-xx.x, 15454E-GBIC-xx.x) and CWDM (15454-GBIC-xxxx, 15454E-GBIC-xxxx) GBICs operate in the ONS 15454 G-Series card when the card is configured in Gigabit Ethernet Transponding mode or in Ethernet over SDH mode. DWDM and CWDM GBICs are both wavelength division multiplexing (WDM) technologies and operate over single-mode fibers with SC connectors. Cisco CWDM GBIC technology uses a 20 nm wavelength grid and Cisco ONS 15454 DWDM GBIC technology uses a 1 nm wavelength grid. CTC displays the specific wavelengths of the installed CWDM or DWDM GBICs. DWDM wavelengths are spaced closer together and require more precise lasers than CWDM. The DWDM spectrum allows for optical signal amplification. For more information on G-Series card transponding mode, see the *Cisco ONS 15454 Reference Manual*.

The DWDM and CWDM GBICs receive across the full 1300 nm and 1500 nm bands, which includes all CWDM, DWDM, LX/LH, ZX wavelengths, but transmit on one specified wavelength. This capability can be exploited in some of the G-Series transponding modes by receiving wavelengths that do not match the specific transmission wavelength.



#### Note

G1000-4 cards support CWDM and DWDM GBICs. G1K-4 cards with the Common Language Equipment Identification (CLEI) code of WM51RWPCAA (manufactured after August 2003) support CWDM and DWDM GBICs. G1K-4 cards manufactured prior to August 2003 do not support CWDM or DWDM GBICs.

The ONS 15454-supported CWDM GBICs reach up to 100 to 120 km over single-mode fiber and support eight wavelengths as shown in [Table 5-16](#).

**Table 5-16 Supported Wavelengths for CWDM GBICs**

CWDM GBIC Wavelengths	1470 nm	1490 nm	1510 nm	1530 nm	1550 nm	1570 nm	1590 nm	1610 nm
Corresponding GBIC Colors	Gray	Violet	Blue	Green	Yellow	Orange	Red	Brown
Band	47	49	51	53	55	57	59	61

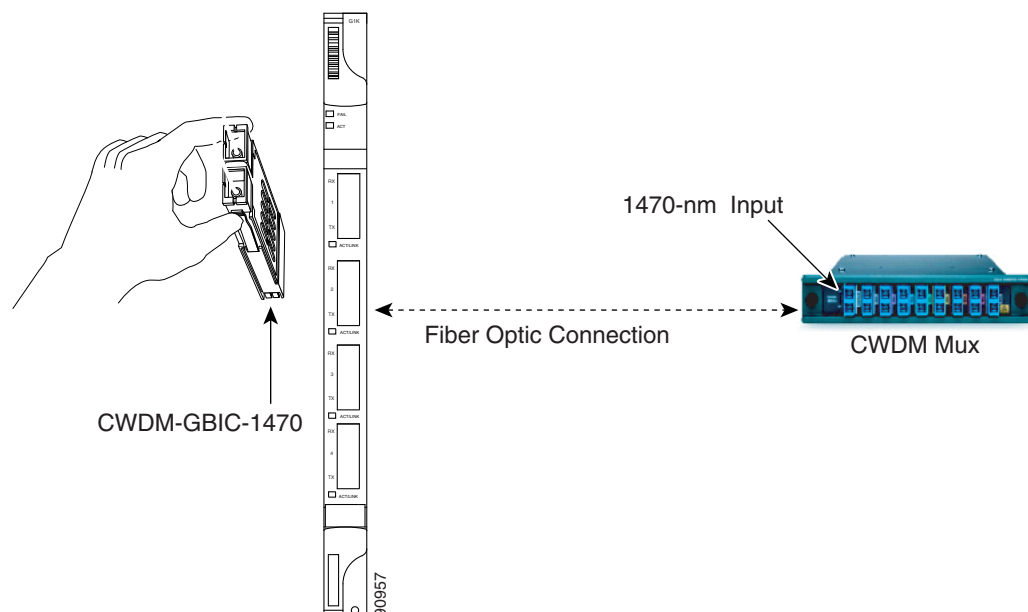
The ONS 15454-supported DWDM GBICs reach up to 100 to 120 km over single-mode fiber and support 32 different wavelengths in the red and blue bands. Paired with optical amplifiers, such as the Cisco ONS 15216, the DWDM GBICs allow maximum unregenerated spans of approximately 300 km (Table 5-17).

**Table 5-17 Supported Wavelengths for DWDM GBICs**

<b>Blue Band</b>	1530.33 nm	1531.12 nm	1531.90 nm	1532.68 nm	1534.25 nm	1535.04 nm	1535.82 nm	1536.61 nm
	1538.19 nm	1538.98 nm	1539.77 nm	1540.56 nm	1542.14 nm	1542.94 nm	1543.73 nm	1544.53 nm
<b>Red Band</b>	1546.12 nm	1546.92 nm	1547.72 nm	1548.51 nm	1550.12 nm	1550.92 nm	1551.72 nm	1552.52 nm
	1554.13 nm	1554.94 nm	1555.75 nm	1556.55 nm	1558.17 nm	1558.98 nm	1559.79 nm	1560.61 nm

### 5.8.2.1.1 Placement of CWDM or DWDM GBICs

CWDM or DWDM GBICs for the G-Series card come in set wavelengths and are not provisionable. The wavelengths are printed on each GBIC, for example, CWDM-GBIC-1490. The user must insert the specific GBIC transmitting the wavelength required to match the input of the CWDM/DWDM device for successful operation (Figure 5-8). Follow your site plan or network diagram for the required wavelengths.

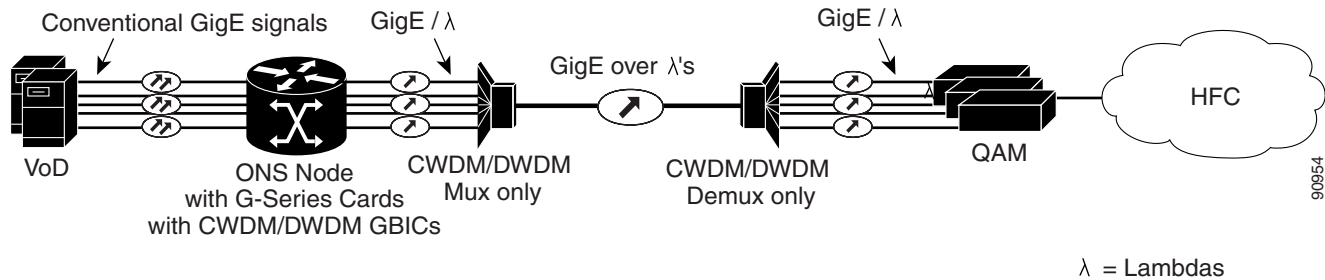
**Figure 5-8 CWDM GBIC with Wavelength Appropriate for Fiber-Connected Device**

The *Cisco ONS 15454 SDH Procedure Guide* contains specific procedures for attaching optical fiber to GBICs and inserting GBICs into the G-Series card.

### 5.8.2.1.2 Example of CWDM or DWDM GBIC Application

A G-Series card equipped with CWDM or DWDM GBICs supports the delivery of unprotected Gigabit Ethernet service over Metro DWDM (Figure 5-9). It can be used in short-haul and long-haul applications.

Figure 5-9 G-Series with CWDM/DWDM GBICs in Cable Network



## 5.8.3 SFP Description

SFPs are integrated fiber optic transceivers that provide high speed serial links from a port or slot to the network. Various latching mechanisms can be utilized on the SFP modules. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for technology type and model. One type of latch available is a mylar tab (Figure 5-10), a second type of latch available is an actuator/button (Figure 5-11), and a third type of latch is a bail clasp (Figure 5-12).

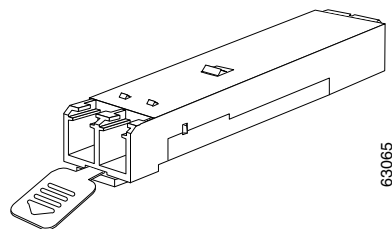
SFP dimensions are:

- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges for are:

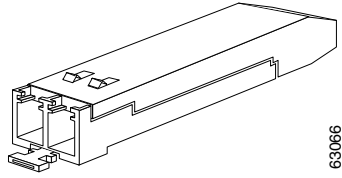
- COM—commercial operating temperature range -5°C to 70°C
- EXT—extended operating temperature range -5°C to 85°C
- IND—industrial operating temperature range -40°C to 85°C

Figure 5-10 Mylar Tab SFP

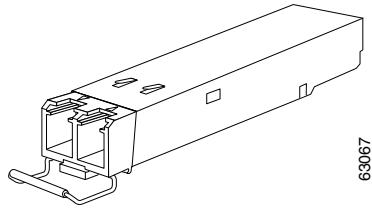




**Figure 5-11 Actuator/Button SFP**



**Figure 5-12 Bail Clasp SFP**







## Storage Access Networking Cards

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The FC\_MR-4 card is a 1.0625- or 2.125-Gbps Fibre Channel/Fiber Connectivity (FICON) card that integrates non-SDH framed protocols into an SDH time-division multiplexing (TDM) platform through virtually concatenated payloads. This chapter provides information about the FC\_MR-4 card. For installation and step-by-step circuit configuration procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [6.1 FC\\_MR-4 Card Overview, page 6-1](#)
- [6.2 FC\\_MR-4 Card Modes, page 6-3](#)
- [6.3 FC\\_MR-4 Card Application, page 6-5](#)

### 6.1 FC\_MR-4 Card Overview

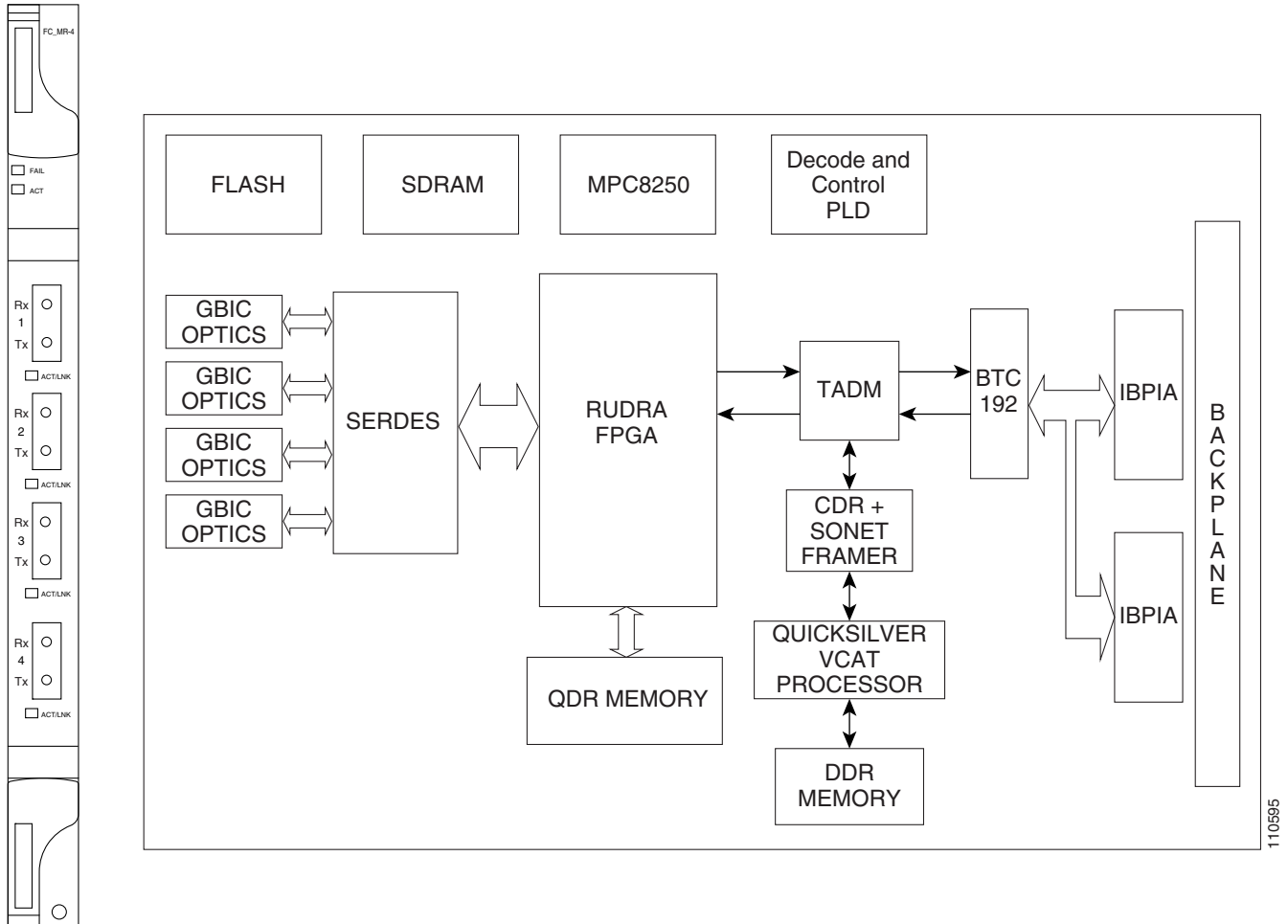
The Fibre Channel Multirate 4-port (FC\_MR-4) card uses pluggable Gigabit Interface Converters (GBICs) to transport non-SONET/SDH-framed, block-coded protocols over SONET/SDH. The FC\_MR-4 enables four client Fibre Channel (FC) ports to be transported over SONET/SDH, encapsulating the frames using the ITU-T Generic Framing Protocol (GFP) format and mapping them into either T1X1 G.707-based Virtual Concatenated (VCAT) payloads or standard contiguously concatenated SONET/SDH payloads. The FC\_MR-4 card has the following features:

- Four FICON ports operating at 1 Gbps or 2 Gbps
  - All four ports can be operational at any time due to subrate support
  - Advanced Distance Extension capability (buffer-to-buffer credit spoofing)
- Pluggable GBIC optics
  - Dual rate (1G/2G): MM (550 m) and SM (10 km)
  - Single rate (1G): SX (550 m) and LX (10 km)
- SONET/SDH support
  - Four 1.0625 Gbps FC channels can be mapped into SONET/SDH containers as small as STS1/VC3 (subrate), with a minimum of STS-24c/VC4-8c for full rate, and as large as STS48c/VC4-24c.
  - Four 2.125 Gbps FC channels can be mapped into SONET/SDH containers as small as STS1/VC3 (subrate), with a minimum of STS48c/VC4-24c for full rate, and as large as STS48c/VC4-24c.
- Frame encapsulation: ITU-T G.7041 Generic Framing Procedure-Transparent (GFP-T)

- High-order SONET/SDH VCAT support (STS1-xv/VC-3 and STS3c-xv/VC-4)

Figure 6-1 shows the FC\_MR-4 faceplate and block diagram.

**Figure 6-1** FC\_MR-4 Faceplate and Block Diagram



## 6.1.1 FC\_MR-4 Card-Level Indicators

Table 6-1 describes the two card-level LEDs on the FC\_MR-4 card.

**Table 6-1** FC\_MR-4 Card-Level Indicators

Card-Level Indicators	Description
<b>Red FAIL LED</b>	The red FAIL LED indicates that the card's processor is not ready. Replace the card if the red FAIL LED persists.
<b>Green ACT LED</b>	If the ACTV/STBY LED is green, the card is operational and ready to carry traffic.
<b>Amber ACT LED</b>	If the ACTV/STBY LED is amber, the card is rebooting.

## 6.1.2 FC\_MR-4 Port-Level Indicators

Each FC\_MR-4 port has a corresponding ACT/LNK LED. The ACT/LNK LED is solid green if the port is available to carry traffic, is provisioned as in-service, and in the active mode. The ACT/LNK LED is flashing green if the port is carrying traffic. The ACT/LNK LED is steady amber if the port is not enabled and the link is connected, or if the port is enabled and the link is connected but there is an SONET/SDH transport error. The ACT/LNK LED is unlit if there is no link.

You can find the status of the card ports using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for a complete description of the alarm messages.

## 6.1.3 FC\_MR-4 Compatibility

The FC\_MR-4 cards can be installed in Slots 1 to 6 and 12 to 17 when used with XC-VXL-2.5G, XC-VXL-10G, and XC10G cards. The FC\_MR-4 card can be provisioned as part of any valid ONS 15454 SONET/SDH network topology, such as a subnetwork connection protection ring (SNCP) (CCAT circuits only), multiplex section-shared protection ring (MS-SPRing), 1+1 subnetwork connection (SNC), unprotected, or linear network topologies. The FC\_MR-4 card is compatible with Software R4.6 and greater.

## 6.2 FC\_MR-4 Card Modes

The FC\_MR-4 card can operate in two modes:

- Line Rate mode. This mode is backward compatible with Software Release 4.6 Line Rate mode.
- Enhanced mode. This mode supports subrate, distance extension, and other enhancements.

The FC\_MR-4 card reboots when changing card modes (a traffic hit results). The FPGA running on the card upgrades to the required image. However, the FPGA image in the card's flash is not be modified.

### 6.2.1 Line-Rate Card Mode

Mapping for the line-rate card mode is summarized here.

- 1 Gbps Fibre Channel/FICON is mapped into:
  - SONET CCAT: STS24c, STS48c
  - SONET VCAT: STS3c-8v, STS1c-24v
  - SDH CCAT: VC4-8c, VC4-16c
  - SDH VCAT: VC4-8v
- 2 Gbps Fibre Channel/FICON is mapped into:
  - SONET CCAT: STS48c
  - SONET VCAT: STS3c-16v, STS1c-48v
  - SDH CCAT: VC4-16c
  - SDH VCAT: VC4-16v

## 6.2.2 Enhanced Card Mode

Features available in enhanced card mode are given in this section.

### 6.2.2.1 Mapping

1 Gbps Fibre Channel/FICON is mapped into:

- SONET CCAT: STS1c, STS3c, STS6c, STS9c, STS12c, STS18c, STS24c, STS48c
- SONET VCAT: STS3c-Nv (N is 1 to 8), STS1c-Nv (N is 1 to 24)
- SDH CCAT: VC4-1c, VC4-2c, VC4-3c, VC4-4c, VC4-6c, VC4-8c, VC4-16c
- SDH VCAT: VC4-Nv (N is 1 to 8)

2 Gbps Fibre Channel/FICON is mapped into:

- SONET CCAT: STS1c, STS3c, STS6c, STS9c, STS12c, STS18c, STS24c, STS36c, STS48c
- SONET VCAT: STS3c-Nv (N is 1 to 16), STS1c-Nv (N is 1 to 48)
- SDH CCAT: VC4-1c, VC4-2c, VC4-3c, VC4-4c, VC4-6c, VC4-8c, VC4-12c, VC4-16c
- SDH VCAT: VC4-16v (N is 1 to 16)

### 6.2.2.2 SW-LCAS

Virtual Concatenation Group (VCG) is reconfigurable with the software link capacity adjustment scheme (SW-LCAS) enabled, as follows:

- Out of service and out of group members can be removed from VCG
- Members with deleted cross connect can be removed from VCG
- Errored members can be autonomously removed from VCG
- Degraded bandwidth VCGs are supported
- VCG is flexible with SW-LCAS enabled (VCG can run traffic as soon as the first cross-connect is provisioned on both sides of the transport)

## 6.2.3 Distance Extension (Enhanced Mode Only)

The following list describes FC\_MR-4 card distance extension capabilities.

- Enabling of SAN extension over long distances through buffer-to-buffer (B2B) credit spoofing.
  - 2300 Km for 1G ports (longer distances supported with lesser throughput)
  - 1150 Km for 2G ports (longer distances supported with lesser throughput)
- Negotiation mechanism to identify if far end FC-over-SONET card supports Cisco proprietary B2B mechanism.
- Auto detection of FC switch B2B credits from FC-SW standards-based ELP frames.
- Support for manual provisioning of credits based on FC switch credits.
- Automatic GFP buffer adjustment based on roundtrip latency between two SL ports.
- Automatic credit recovery during SONET switchovers/failures.

- Insulation for FC switches from any SONET switchovers. No FC fabric reconvergences for SONET failures of less than or equal to 60 ms.

## 6.2.4 Interoperability Features (Enhanced Mode Only)

The interoperability features are as follows:

- Maximum frame size setting to prevent accumulation of oversize PMs for VSAN frames
- Ingress filtering disable for attachment to third party GFP over SONET/SDH equipment

## 6.2.5 Link Integrity

The link integrity features are as follows:

- Data port disabled if upstream data port is not able to send over SONET/SDH Transport
- Data port disabled if SONET/SDH transport is errored

## 6.2.6 Link Recovery

Link recovery has the following features:

- Reduces the impact of SONET/SDH disruptions on attached fiber channel equipment
- Speeds up the recovery of Inter Switch Links (ISL)
- Allows the monitoring of B2B credit depletion due to SONET outage and the full recovery of the credits, thus preventing the slow decay of the bandwidth/throughput



**Note**

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Distance Extension and Link Recovery cannot be enabled at the same time.

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## 6.3 FC\_MR-4 Card Application

The FC\_MR-4 card reliably transports a carrier-class, private-line Fibre Channel/FICON transport service. Each FC\_MR-4 card can support up to four 1-Gbps circuits or four 2-Gbps circuits. Four 1.0625 Gbps FC channels can be mapped into containers as small as STS1 (substrate), with a minimum of STS-24c/VC4-8c for full rate, and as large as STS48c/VC4-24c. Four 2.125 Gbps FC channels can be mapped into containers as small as STS1 (sub-rate), with a minimum of STS48c/VC4-24c for full rate, and as large as STS48c/VC4-24c.

The FC\_MR-4 card incorporates features optimized for carrier-class applications such as:

- Carrier-class Fibre Channel/FICON
- 50 ms of switch time through SONET/SDH protection as specified in Telcordia GR-253CORE
- Hitless software upgrades
- Remote Fibre Channel/FICON circuit bandwidth upgrades by means of integrated Cisco Transport Controller (CTC)
- Multiple management options through CTC, Cisco Transport Manager (CTM), TL1 (for SONET only), and Simple Network Management Protocol (SNMP)

The FC\_MR-4 payloads can be transported over the following protected circuit types, in addition to unprotected circuits:

- SNCP (CCAT circuits only)
- MS-SPRing
- Protection channel access (PCA)

The FC\_MR-4 card supports high-order virtual concatenation (VCAT). See the [“10.14 Virtual Concatenated Circuits”](#) section on page 10-22.

The FC\_MR-4 uses pluggable GBICs for client interfaces and is compatible with the following GBIC types:

- ONS-GX-2FC-SML= (short reach 1 or 2 Gbps FC 1310 nm single mode with SC connectors)
- ONS-GX-2FC-MMI= (long reach 2 Gbps FC 850 nm multimode with SC connectors)
- 15454-GBIC-SX (short reach 1 Gbps 850 nm multimode)
- 15454E-GBIC-SX (short reach 1 Gbps 850 nm multimode)
- 15454-GBIC-LX/LH (long reach 1 Gbps 1310 nm multimode)
- 15454E-GBIC-LX/LH (long reach 1 Gbps 1310 nm multimode)





## Card Protection

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This chapter explains the Cisco ONS 15454 SDH card protection configurations. To provision card protection, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [7.1 Electrical Card Protection, page 7-1](#)
- [7.2 STM-N Card Protection, page 7-4](#)
- [7.3 Unprotected Cards, page 7-4](#)
- [7.4 External Switching Commands, page 7-5](#)

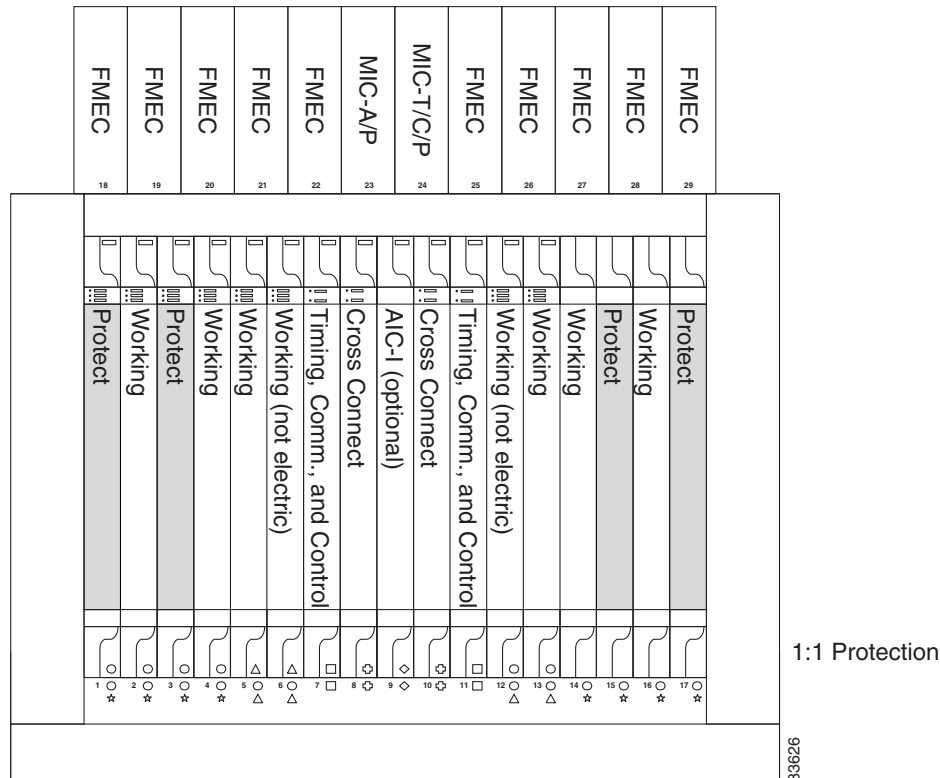
### 7.1 Electrical Card Protection

The ONS 15454 SDH provides a variety of electrical card protection methods. This section describes the protection options.

#### 7.1.1 1:1 Protection

In 1:1 protection, a working card is paired with a protect card of the same type. If the working card fails, the traffic from the working card switches to the protect card. When the failure on the working card is resolved, traffic automatically reverts to the working card. [Figure 7-1](#) shows the ONS 15454 SDH in a 1:1 protection configuration; Slot 2 is protecting Slot 1, Slot 4 is protecting Slot 3, Slot 17 is protecting Slot 16, and Slot 15 is protecting Slot 14. Each working card is paired with a protect card. Slots 6 and 12 are not used for electrical cards. They have no corresponding Front Mount Electrical Connection (FMEC) slots.

Figure 7-1 ONS 15454 SDH Cards in a 1:1 Protection Configuration



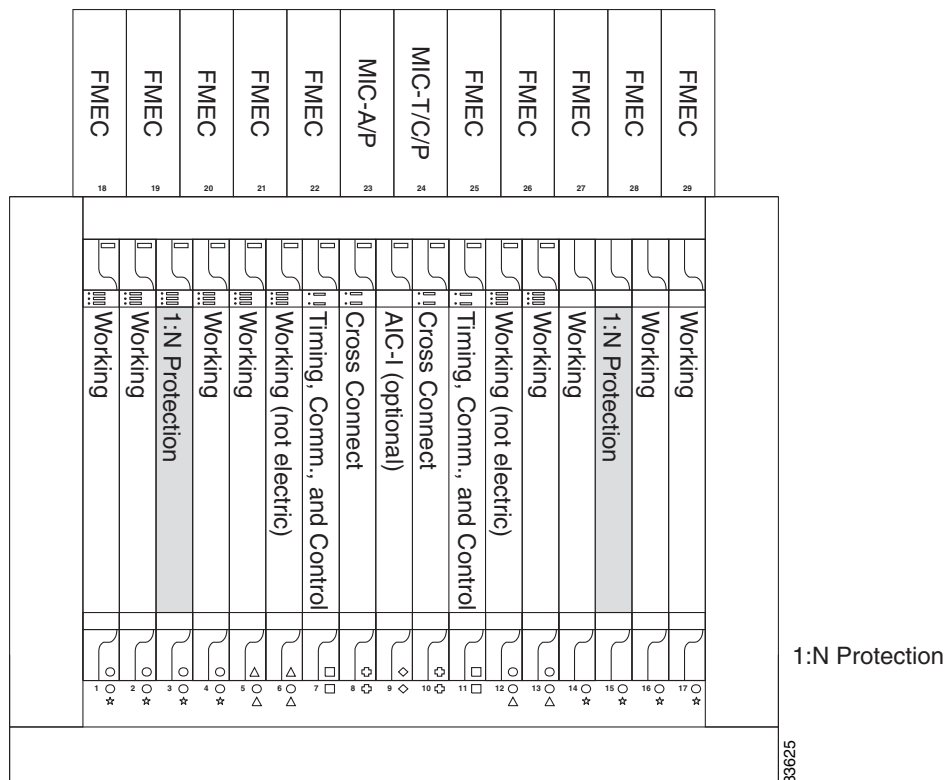
## 7.1.2 1:N Protection

1:N protection allows a single card to protect several working cards. An E1-N-14 card protects up to four E1-N-14 cards, and a DS3i-N-12 card protects up to four DS3i-N-12 cards.

Currently, 1:N protection operates only at the E-1 and DS-3 levels. The 1:N protect cards must match the levels of their working cards. For example, an E1-N-14 protects only E1-N-14 cards, and a DS3i-N-12 protects only DS3i-N-12 cards.

The physical E-1 or DS-3 ports on the ONS 15454 SDH FMEC cards use the working card until the working card fails. When the node detects this failure, the protect card takes over the physical E-1 or DS-3 electrical interfaces through the relays and signal bridging on the backplane. [Figure 7-2](#) shows the ONS 15454 SDH in a 1:N protection configuration. Each side of the shelf assembly has only one card protecting all of the cards on that side.

Figure 7-2 ONS 15454 SDH Cards in a 1:N Protection Configuration



### 7.1.2.1 Revertive Switching

1:N protection supports revertive switching. Revertive switching sends the electrical interfaces back to the original working card after the card comes back online. Detecting an active working card triggers the reversion process. There is a variable time period for the lag between detection and reversion, called the revertive delay, which you can set using Cisco Transport Controller (CTC). For instructions, refer to the *Cisco ONS 15454 SDH Procedure Guide*. All cards in a protection group share the same reversion settings. 1:N protection groups default to automatic reversion.



#### Caution

A user-initiated switch (external switching command) overrides the revertive delay, that is, clearing the switch clears the timer.

### 7.1.2.2 1:N Protection Guidelines

Several rules apply to 1:N protection groups in the ONS 15454 SDH:

- Working and protect card groups must reside in the same card bank (A or B).
- The 1:N protect card must reside in Slot 3 for side A and Slot 15 for side B.
- Working cards might sit on either or both sides of the protect card.

The ONS 15454 SDH supports 1:N equipment protection for all add/drop multiplexer configurations (ring, linear, and terminal), as specified by ITU-T G.841.

The ONS 15454 SDH automatically detects and identifies a 1:N protect card when the card is installed in Slot 3 or Slot 15. However, the slot containing the 1:N card in a protection group must be manually provisioned as a protect slot because by default, all cards are working cards.

## 7.2 STM-N Card Protection

With 1+1 port-to-port protection, any number of ports on the protect card can be assigned to protect the corresponding ports on the working card. The working and protect cards do not have to be placed side by side in the node. A working card must be paired with a protect card of the same type and number of ports. For example, a single-port STM-4 must be paired with another single-port STM-4, and a four-port STM-4 must be paired with another four-port STM-4. You cannot create a 1+1 protection group if one card is single-port and the other is multiport, even if the STM-N rates are the same. The protection takes place on the port level, any number of ports on the protect card can be assigned to protect the corresponding ports on the working card.

For example, on a four-port card, you can assign one port as a protection port on the protect card (protecting the corresponding port on the working card) and leave three ports unprotected. Conversely, you can assign three ports as protection ports and leave one port unprotected.

With 1:1 or 1:N protection (electrical cards), the protect card must protect an entire slot. In other words, all the ports on the protect card are used in the protection scheme.

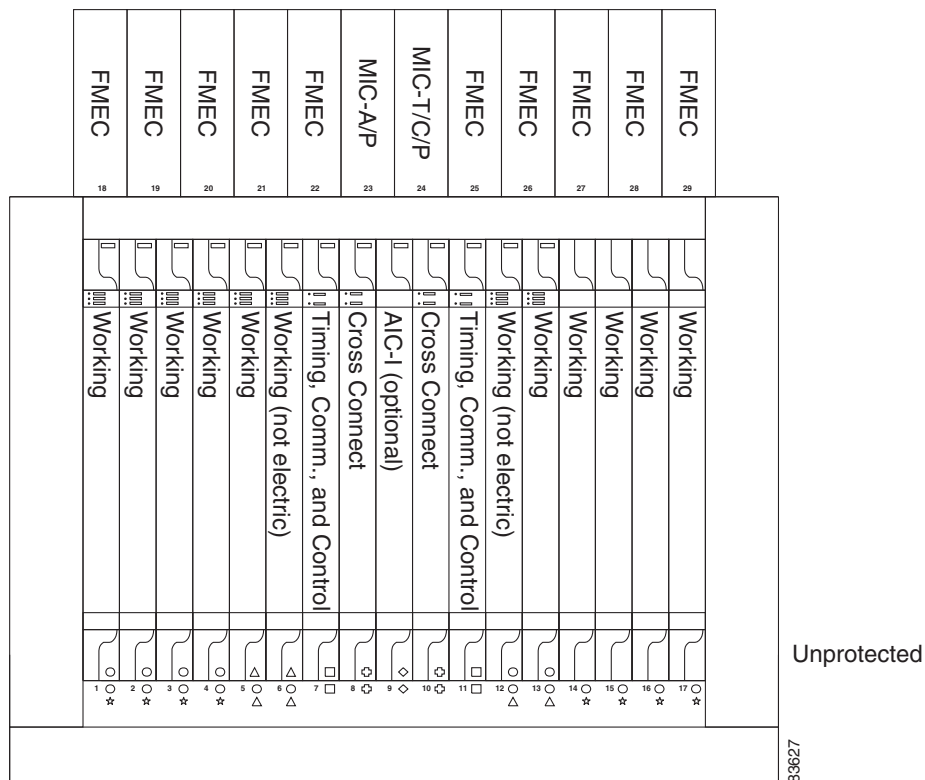
1+1 span protection can be either revertive or nonrevertive. With nonrevertive 1+1 protection, when a failure occurs and the signal switches from the working card to the protect card, the signal stays switched to the protect card until it is manually switched back. Revertive 1+1 protection automatically switches the signal back to the working card when the working card comes back online.

You create and modify protection schemes using CTC software. For more information, refer to the “Turn up Node” chapter in the *Cisco ONS 15454 SDH Procedure Guide*.

## 7.3 Unprotected Cards

Unprotected cards are not included in a protection scheme; therefore, a card failure or a signal error results in lost data. An unprotected configuration is sometimes called 1:0 protection. Because no bandwidth is reserved for protection, unprotected schemes maximize the available ONS 15454 SDH bandwidth. [Figure 7-3](#) shows the ONS 15454 SDH in an unprotected configuration. All cards are in a working state.

Figure 7-3 ONS 15454 SDH Cards in an Unprotected Configuration



## 7.4 External Switching Commands

The external switching commands on the ONS 15454 SDH are Manual, Force, and Lock out. If you choose a Manual switch, the command will switch traffic only if the path has an error rate less than the signal degrade (SD) bit error rate threshold. A Force switch will switch traffic even if the path has SD or signal fail (SF) conditions; however, a Force switch will not override an SF on a 1+1 protection channel. A Force switch has a higher priority than a Manual switch. Lock outs, which prevent traffic from switching to the protect port under any circumstance, can only be applied to protect cards (in 1+1 configurations). Lockouts have the highest priority.



**Note**

Force and Manual switches do not apply to 1:1 protection groups; these ports have a single switch command.

Another way to inhibit protection switching in a 1+1 configuration is to apply a lock on to the working port. A working port with a lock on applied cannot switch traffic to the protect port in the protection group (pair). In 1:1 protection groups, working or protect ports can have a lock on.





# Cisco Transport Controller Operation

This chapter describes Cisco Transport Controller (CTC), the Cisco software interface for the Cisco ONS 15454 SDH. For CTC set up and login information, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [8.1 CTC Software Delivery Methods, page 8-1](#)
- [8.2 CTC Installation Overview, page 8-3](#)
- [8.3 PC and UNIX Workstation Requirements, page 8-3](#)
- [8.4 ONS 15454 SDH Connection, page 8-5](#)
- [8.5 CTC Window, page 8-6](#)
- [8.6 TCC2/TCC2P Card Reset, page 8-15](#)
- [8.7 TCC2/TCC2P Card Database, page 8-15](#)
- [8.8 Software Revert, page 8-15](#)

## 8.1 CTC Software Delivery Methods

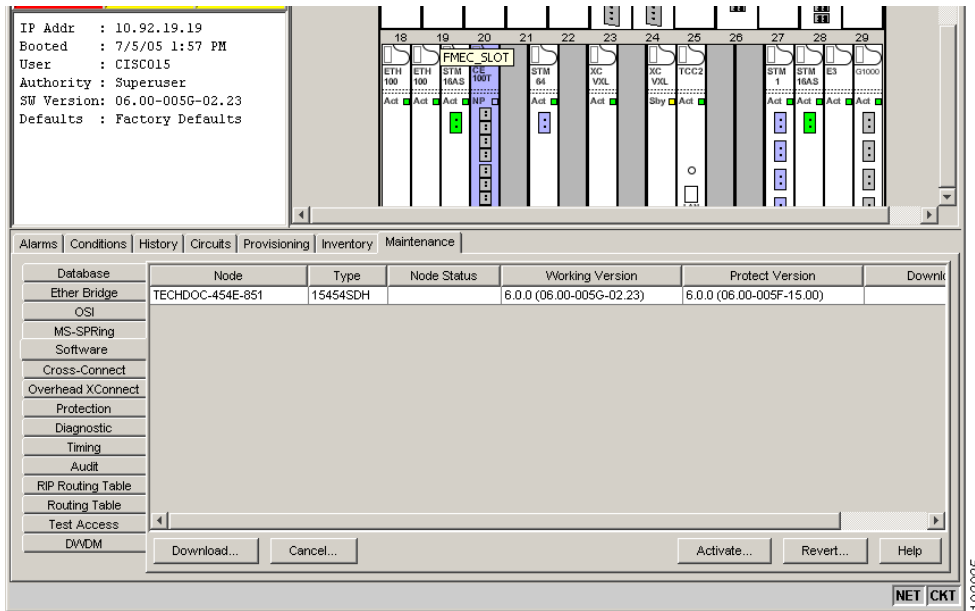
ONS 15454 SDH provisioning and administration is performed using the CTC software. CTC is a Java application that is installed in two locations; CTC is stored on the Advanced Timing, Communications, and Control (TCC2) card or the Advanced Timing, Communications, and Control Plus (TCC2P) card, and it is downloaded to your workstation the first time you log into the ONS 15454 SDH with a new software release.

### 8.1.1 CTC Software Installed on the TCC2/TCC2P Card

CTC software is preloaded on the ONS 15454 SDH TCC2/TCC2P card; therefore, you do not need to install software on the TCC2/TCC2P cards. When a new CTC software version is released, use the release-specific software upgrade guide to upgrade the ONS 15454 SDH software on the TCC2/TCC2P cards.

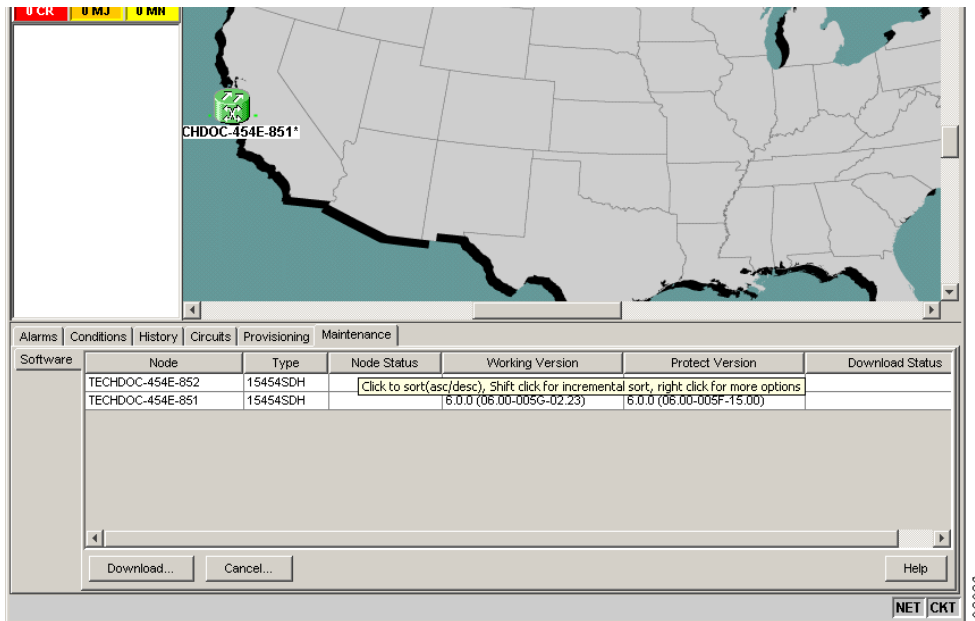
When you upgrade CTC software, the TCC2/TCC2P cards store the new CTC version as the protect CTC version. When you activate the new CTC software, the TCC2/TCC2P cards store the older CTC version as the protect CTC version, and the newer CTC release becomes the working version. You can view the software versions that are installed on an ONS 15454 SDH by selecting the Maintenance > Software tabs in node view ([Figure 8-1](#)).

Figure 8-1 CTC Software Versions, Node View



Select the Maintenance > Software tabs in network view to display the software versions installed on all the network nodes (Figure 8-2).

Figure 8-2 CTC Software Versions, Network View





## 8.1.2 CTC Software Installed on the PC or UNIX Workstation

CTC software is downloaded from the TCC2/TCC2P cards and installed on your computer automatically after you connect to the ONS 15454 SDH with a new software release for the first time. Downloading the CTC software files automatically ensures that your computer is running the same CTC software version as the TCC2/TCC2P cards you are accessing. The computer CTC software files are stored in the temporary directory designated by your computer's operating system. You can use the Delete CTC Cache button to remove files stored in the temporary directory. If the files are deleted, they download the next time you connect to an ONS 15454 SDH. Downloading the Java archive files, called "JAR" files, for CTC takes several minutes depending on the bandwidth of the connection between your workstation and the ONS 15454 SDH. For example, JAR files downloaded from a modem or a data communication channel (DCC) network link require more time than JAR files downloaded over a LAN connection.

## 8.2 CTC Installation Overview

To connect to an ONS 15454 SDH using CTC, you enter the ONS 15454 SDH IP address in the URL field of Netscape Communicator or Microsoft Internet Explorer. After connecting to an ONS 15454 SDH, the following occurs automatically:

1. A CTC launcher applet is downloaded from the TCC2/TCC2P card to your computer.
2. The launcher determines whether your computer has a CTC release matching the release on the ONS 15454 SDH TCC2/TCC2P card.
3. If the computer does not have CTC installed, or if the installed release is older than the TCC2/TCC2P card's version, the launcher downloads the CTC program files from the TCC2/TCC2P card.
4. The launcher starts CTC. The CTC session is separate from the web browser session, so the web browser is no longer needed. Always log into nodes having the latest software release. If you log into an ONS 15454 SDH that is connected to ONS 15454 SDHs with older versions of CTC, CTC files are downloaded automatically to enable you to interact with those nodes. The CTC file download occurs only when necessary, such as during your first login. You cannot interact with nodes on the network that have a software version later than the node that you used to launch CTC.

Each ONS 15454 SDH can handle up to five concurrent CTC sessions. CTC performance can vary, depending upon the volume of activity in each session, network bandwidth, and TCC2/TCC2P card load.

**Note**

The TCC2/TCC2P card requires Software R4.0 or later.

## 8.3 PC and UNIX Workstation Requirements

To use CTC in the ONS 15454 SDH, your computer must have a web browser with the correct Java Runtime Environment (JRE) installed. The correct JRE for each CTC software release is included on the ONS 15454 SDH software CD and the ONS 15454 SDH documentation CD. If you are running multiple CTC software releases on a network, the JRE installed on the computer must be compatible with the different software releases.

You can change the JRE version on the Preferences dialog box JRE tab. When you change the JRE version on the JRE tab, you must exit and restart CTC for the new JRE version to take effect. [Table 8-1](#) shows JRE compatibility with ONS software releases.

**Table 8-1** JRE Compatibility

ONS Software Release	JRE 1.2.2 Compatible	JRE 1.3 Compatible	JRE 1.4 Compatible
ONS 15454 SDH Release 3.3	Yes	Yes	No
ONS 15454 SDH Release 3.4	No	Yes	No
ONS 15454 SDH Release 4.0 <sup>1</sup>	No	Yes	No
ONS 15454 SDH Release 4.1	No	Yes	No
ONS 15454 SDH Release 4.5	No	Yes	No
ONS 15454 SDH Release 4.6	No	Yes	Yes
ONS 15454 SDH Release 4.7	No	Yes	Yes
ONS 15454 SDH Release 5.0	No	No	Yes

1. Software releases 4.0 and later notify you if an older version of the JRE is running on your PC or UNIX workstation.

**Note**

To avoid network performance issues, Cisco recommends managing a maximum of 50 nodes concurrently with CTC. The 50 nodes can be on a single DCC or split across multiple DCCs. Cisco does not recommend running multiple CTC sessions when managing two or more large networks.

To manage more than 50 nodes, Cisco recommends using Cisco Transport Manager (CTM). If you do use CTC to manage more than 50 nodes, you can improve performance by adjusting the heap size; see the “General Troubleshooting” chapter of the *Cisco ONS 15454 SDH Troubleshooting Guide*. You can also create login node groups; see the “Connect the PC and Log Into the GUI” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

[Table 8-2](#) lists the requirements for PCs and UNIX workstations. In addition to the JRE, the Java plug-in and modified java.policy file are also included on the ONS 15454 SDH software CD and the ONS 15454 SDH documentation CD.

**Table 8-2** CTC Computer Requirements

Area	Requirements	Notes
Processor (PC only)	Pentium 4 processor or equivalent	A faster CPU is recommended if your workstation runs multiple applications or if CTC manages a network with a large number of nodes and circuits.
RAM	512 MB or more	A minimum of 1 GB is recommended if your workstation runs multiple applications or if CTC manages a network with a large number of nodes and circuits.
Hard drive	20 GB hard drive with 50 MB of space available	CTC application files are downloaded from the TCC2/TCC2P to your computer’s Temp directory. These files occupy 5 to 10 MB of hard drive space.

**Table 8-2 CTC Computer Requirements (continued)**

Area	Requirements	Notes
Operating system	<ul style="list-style-type: none"> <li>PC: Windows 98, Windows NT 4.0, Windows 2000, or Windows XP</li> <li>Workstation: Ultra 10 Sun running SunOS 6, 7, or 8</li> </ul>	—
Java Runtime Environment	JRE 1.4.2	<p>JRE 1.4.2 is installed by the CTC Installation Wizard included on the Cisco ONS 15454 SDH software and documentation CDs. JRE 1.4.2 provides enhancements to CTC performance, especially for large networks with numerous circuits.</p> <p>Cisco recommends that you use JRE 1.4.2 for networks with Software R5.0 nodes. If CTC must be launched directly from nodes running software earlier than R5.0, Cisco recommends JRE 1.3.1_02.</p>
Web browser	<ul style="list-style-type: none"> <li>PC: Netscape 4.76, Netscape 7.x, Internet Explorer 6.x</li> <li>UNIX Workstation: Netscape 4.76, Netscape 7.x</li> </ul>	<p>For the PC, use JRE 1.4.2 or 1.3.1_02 with any supported web browser. For UNIX, use JRE 1.4.2 with Netscape 7.x or JRE 1.3.1_02 with Netscape 4.76.</p> <p>Netscape 4.76 or 7.x is available at the following site:  <a href="http://channels.netscape.com/ns/browsers/default.jsp">http://channels.netscape.com/ns/browsers/default.jsp</a></p> <p>Internet Explorer 6.x is available at the following site:  <a href="http://www.microsoft.com">http://www.microsoft.com</a></p>
Java.policy file	A java.policy file modified for CTC	The java.policy file is modified by the CTC Installation Wizard included on the Cisco ONS 15454 SDH software and documentation CDs.
Cable	User-supplied Category 5 straight-through cable with RJ-45 connectors on each end to connect the computer directly to the ONS 15454 SDH or through a LAN	—

## 8.4 ONS 15454 SDH Connection

You can connect to the ONS 15454 SDH in multiple ways. You can connect your PC directly to the ONS 15454 SDH (local craft connection) using the RJ-45 port on the TCC2/TCC2P card, to the LAN pins on the MIC-C/T/P, or by connecting your PC to a hub or switch that is connected to the ONS 15454

SDH. You can connect to the ONS 15454 SDH through a LAN or modem, and you can establish TL1 connections from a PC or TL1 terminal. [Table 8-3](#) lists the ONS 15454 SDH connection methods and requirements.

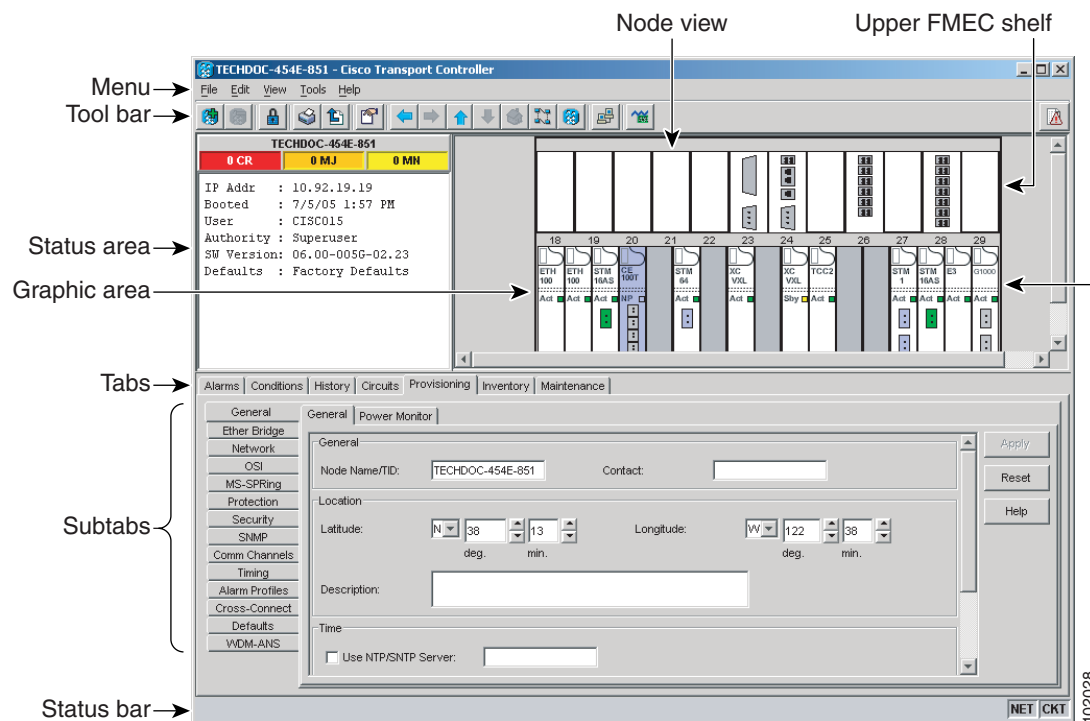
**Table 8-3 ONS 15454 SDH Connection Methods**

Method	Description	Requirements
Local craft	Refers to onsite network connections between the CTC computer and the ONS 15454 SDH using one of the following: <ul style="list-style-type: none"> <li>• The RJ-45 (LAN) port on the TCC2/TCC2P card</li> <li>• The LAN pins on the ONS 15454 SDH MIC-C/T/P FMEC</li> <li>• A hub or switch to which the ONS 15454 SDH is connected</li> </ul>	<ul style="list-style-type: none"> <li>• If you do not use Dynamic Host Configuration Protocol (DHCP), you must change the computer IP address, subnet mask, and default router, or use automatic host detection.</li> </ul>
Corporate LAN	Refers to a connection to the ONS 15454 SDH through a corporate or network operations center (NOC) LAN.	<ul style="list-style-type: none"> <li>• The ONS 15454 SDH must be provisioned for LAN connectivity, including IP address, subnet mask, default gateway.</li> <li>• The ONS 15454 SDH must be physically connected to the corporate LAN.</li> <li>• The CTC computer must be connected to the corporate LAN that has connectivity to the ONS 15454 SDH.</li> </ul>
TL1	Refers to a connection to the ONS 15454 SDH using TL1 rather than CTC. TL1 sessions can be started from CTC, or you can use a TL1 terminal. The physical connection can be a craft connection, corporate LAN, or a TL1 terminal.	—
Remote	Refers to a connection made to the ONS 15454 SDH using a modem.	<ul style="list-style-type: none"> <li>• A modem must be connected to the ONS 15454 SDH.</li> <li>• The modem must be provisioned for ONS 15454 SDH. To run CTC, the modem must be provisioned for Ethernet access.</li> </ul>

## 8.5 CTC Window

The CTC window appears after you log into an ONS 15454 SDH ([Figure 8-3](#)). The window includes a menu bar, toolbar, and a top and bottom pane. The top pane provides status information about the selected objects and a graphic of the current view. The bottom pane provides tabs and subtabs to view ONS 15454 SDH information and perform ONS 15454 SDH provisioning and maintenance. From this window you can display three ONS 15454 SDH views: network, node, and card.

Figure 8-3 Node View (Default Login View)



## 8.5.1 Node View

Node view, shown in [Figure 8-3](#), is the first view open after you log into an ONS 15454 SDH. The login node is the first node shown, and it is the “home view” for the session. Node view allows you to view and manage one ONS 15454 SDH node. The status area shows the node name; IP address; session boot date and time; number of Critical (CR), Major (MJ), and Minor (MN) alarms; the name of the current logged-in user; and the security level of the user; software version; and the network element default setup.

### 8.5.1.1 CTC Card Colors

The graphic area of the CTC window depicts the ONS 15454 SDH shelf assembly. The colors of the cards in the graphic reflect the real-time status of the physical card and slot ([Table 8-4](#)).

**Table 8-4** Node View Card Colors

Card Color	Status
Gray	Slot is not provisioned; no card is installed.
Violet	Slot is provisioned; no card is installed.
White	Slot is provisioned; a functioning card is installed.
Yellow	Slot is provisioned; a Minor alarm condition exists.

**Table 8-4 Node View Card Colors (continued)**

Card Color	Status
Orange	Slot is provisioned; a Major alarm condition exists.
Red	Slot is provisioned; a Critical alarm exists.

The colors of the Front Mount Electrical Connection (FMEC) cards reflect the real-time status of the physical FMEC cards. [Table 8-5](#) lists the FMEC card colors. The FMEC ports shown in CTC do not change color.

**Note**

You cannot preprovision FMECs.

**Table 8-5 Node View FMEC Color**

Upper Shelf FMEC Color	Status
White	Functioning card is installed.
Yellow	Minor alarm condition exists.
Orange (Amber)	Major alarm condition exists.
Red	Critical alarm exists.

Port color in both card and node view indicates the port service state. [Table 8-6](#) lists the port colors and their service states. For more information about port service states, see [Appendix B, “Administrative and Service States.”](#)

**Table 8-6 Node View Card Port Colors and Service States**

Port Color	Service State	Description
Blue	Locked-enabled,loopback	Port is in a loopback state. On the card in node view, a line between ports indicates that the port is in terminal or facility loopback (see <a href="#">Figure 8-4</a> and <a href="#">Figure 8-5</a> ). Traffic is carried and alarm reporting is suppressed. Raised fault conditions, whether or not their alarms are reported, can be retrieved on the CTC Conditions tab or by using the TL1 RTRV-COND command.
Blue	Locked-enabled,maintenance	Port is out-of-service for maintenance. Traffic is carried and loopbacks are allowed. Alarm reporting is suppressed. Raised fault conditions, whether or not their alarms are reported, can be retrieved on the CTC Conditions tab or by using the TL1 RTRV-COND command. Use Locked-enabled,maintenance for testing or to suppress alarms temporarily. Change the state to Unlocked-enabled; Locked-enabled,disabled; or Unlocked-disabled,automaticInService when testing is complete.
Gray	Locked-enabled,disabled	The port is out-of-service and unable to carry traffic. Loopbacks are not allowed in this service state.

**Table 8-6 Node View Card Port Colors and Service States (continued)**

Port Color	Service State	Description
Green	Unlocked-enabled	The port is fully operational and performing as provisioned. The port transmits a signal and displays alarms; loopbacks are not allowed.
Violet	Unlocked-disabled, automaticInService	The port is out-of-service, but traffic is carried. Alarm reporting is suppressed. The node monitors the ports for an error-free signal. After an error-free signal is detected, the port stays in this state for the duration of the soak period. After the soak period ends, the port service state changes to Unlocked-enabled.  Raised fault conditions, whether or not their alarms are reported, can be retrieved on the CTC Conditions tab or by using the TL1 RTRV-COND command. The AINS port will automatically transition to Unlocked-enabled when a signal is received for the length of time provisioned in the soak field.

**Figure 8-4 Terminal Loopback Indicator****Figure 8-5 Facility Loopback Indicator**

The wording on a lower-shelf card in node view shows the status of a card (Active, Standby, Loading, or Not Provisioned). [Table 8-7](#) lists the card statuses.

**Table 8-7 Node View Card States**

Lower Shelf Card Status	Description
Sty	Card is in standby.
Act	Card is active.
NP	Card is not present.
Ldg	Card is resetting.

The graphics on a port in node view show the state of a port (diagonal lines or loop graphics). [Table 8-8](#) lists the port graphic and their description.

**Table 8-8 Node View Port Graphics**

Lower Shelf Port Graphics	Description
Multiple diagonal lines on port	Port is in service and card was reset.
Loop graphic on port	Port is in service and has a loopback provisioned in Card View > Maintenance > Loopback tabs.

### 8.5.1.2 Node View Card Shortcuts

If you move your mouse over cards in the graphic, popups display additional information about the card including the card type; the card status (active or standby); the type of alarm, such as Critical, Major, and Minor (if any); and the alarm profile used by the card. Right-click a card to reveal a shortcut menu, which you can use to open, reset, or delete a card. Right-click a slot to preprovision a card (that is, provision a slot before installing the card).

### 8.5.1.3 Node View Tabs

[Table 8-9](#) lists the tabs and subtabs available in the node view.

**Table 8-9 Node View Tabs and Subtabs**

Tab	Description	Subtabs
Alarms	Lists current alarms (CR, MJ, MN) for the node and updates them in real time.	—
Conditions	Displays a list of standing conditions on the node.	—
History	Provides a history of node alarms including date, type, and severity of each alarm. The Session subtab displays alarms and events for the current session. The Node subtab displays alarms and events retrieved from a fixed-size log on the node.	Session, Node
Circuits	Creates, deletes, edits, and maps circuits.	—
Provisioning	Provisions the ONS 15454 SDH node.	General, Ether Bridge, Network, Protection, MS-SPRing, Security, SNMP, Comm Channels, Timing, Alarm Profiles, Defaults, UCP, WDM-ANS



**Table 8-9 Node View Tabs and Subtabs (continued)**

Tab	Description	Subtabs
Inventory	Provides inventory information (part number, serial number, CLEI codes) for cards installed in the node. Allows you to delete and reset cards.	—
Maintenance	Performs maintenance tasks for the node.	Database, Ether Bridge, Protection, MS-SPRing, Software, Cross-Connect, Overhead XConnect, Diagnostic, Timing, Audit, Routing Table, RIP Routing Table, Test Access

## 8.5.2 Network View

Network view allows you to view and manage ONS 15454 SDHs that have DCC connections to the node that you logged into and any login node groups you selected (Figure 8-6).

**Figure 8-6 Network in CTC Network View**

Bold letters indicate login node, asterisk indicates topology host

Icon color indicates node status

Dots indicate selected node

Circuit Name	Type	Size	OCHNC Vfen	Dir	OCHNC Dir	Protection	Status	Source	Destinat
HOP_svt-mz-179...	HOP	VC4-64c	N/A	2-way	N/A	1+1	ACTIVE	svt-mz-179/s5/p1/vc	svt-mz-e180/
HOP_svt-mz-179...	HOP	VC4-64c	N/A	1-way	N/A	N/A	ACTIVE	svt-mz-e180/s13/p1/	svt-mz-e180/

**Note**

Nodes with DCC connections to the login node do not appear if you checked Disable Network Discovery check box in the Login dialog box.

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The graphic area displays a background image with colored ONS 15454 SDH icons. A Superuser can set up the logical network view feature, which enables each user to see the same network view.

The lines show DCC connections between the nodes. DCC connections can be green (active) or gray (fail). The lines can also be solid (circuits can be routed through this link) or dashed (circuits cannot be routed through this link).

There are four possible combinations for the appearance of DCCs: green/solid, green/dashed, gray/solid, or gray/dashed. DCC appearance corresponds to the following states: active/routable, active/nonroutable, failed/routable, or failed/nonroutable. Circuit provisioning uses active/routable links. Selecting a node or span in the graphic area displays information about the node and span in the status area.

The color of a node in network view, shown in [Table 8-10](#), indicates the node alarm status.

**Table 8-10 Node Status Shown in Network View**

Color	Alarm Status
Green	No alarms
Yellow	Minor alarms
Orange	Major alarms
Red	Critical alarms
Gray with Unknown#	Node initializing for the first time (CTC displays Unknown# because CTC has not discovered the name of the node yet)

[Table 8-11](#) lists the tabs and subtabs available in network view.

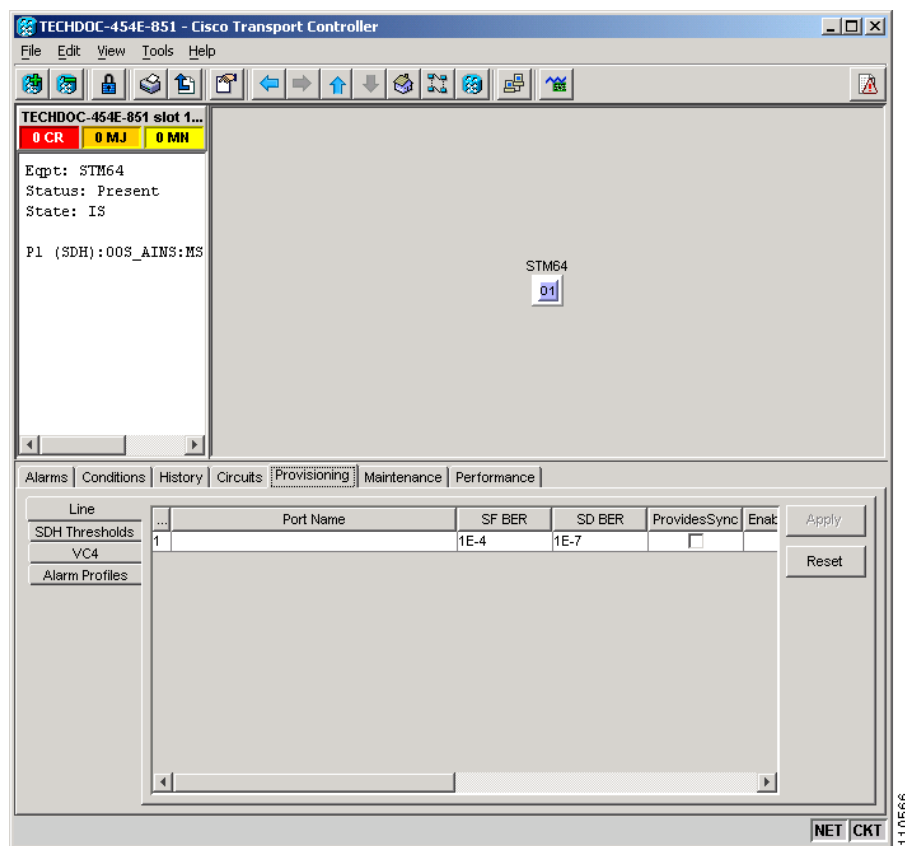
**Table 8-11 Network View Tabs and Subtabs**

Tab	Description	Subtabs
Alarms	Lists current alarms (CR, MJ, MN) for the network and updates them in real time.	—
Conditions	Displays a list of standing conditions on the network.	—
History	Provides a history of network alarms including date, type, and severity of each alarm.	—
Circuits	Creates, deletes, edits, filters, and searches for network circuits.	—
Provisioning	Provisions security, alarm profiles, MS-SPRings and overhead circuits.	Security, Alarm Profiles, MS-SPRing, Overhead Circuits
Maintenance	Displays the type of equipment and the status of each node in the network; displays working and protect software versions; and allows software to be downloaded.	Software

## 8.5.3 Card View

Card view provides information about individual ONS 15454 SDH cards (Figure 8-7). Use this window to perform card-specific maintenance and provisioning. A graphic showing the ports on the card is shown in the graphic area. The status area displays the node name, slot, number of alarms, card type, equipment type, and the card status (active or standby), card state if the card is present, or port state (Table 8-6 on page 8-8). The information that appears and the actions you can perform depend on the card. For more information about card service states, see Appendix B, “Administrative and Service States.”

**Figure 8-7** Card View



**Note**

CTC provides a card view for all ONS 15454 SDH cards except the TCC2, TCC2P, XC10G, XC-VXL-10G, and XC-VXL-2.5G cards. Provisioning for these common control cards occurs at the node view; therefore, no card view is necessary.

Use the card view tabs and subtabs, shown in Table 8-12, to provision and manage the ONS 15454 SDH. The subtabs, fields, and information shown under each tab depend on the card type selected. The Performance tab is not available for the AIC-I card.

**Table 8-12 Card View Tabs and Subtabs**

Tab	Description	Subtabs
Alarms	Lists current alarms (CR, MJ, MN) for the card and updates them in real time.	—
Conditions	Displays a list of standing conditions on the card.	—
History	Provides a history of card alarms including date, object, port, and severity of each alarm.	Session (displays alarms and events for the current session), Card (displays alarms and events retrieved from a fixed-size log on the card)
Circuits	Creates, deletes, edits, and searches for circuits.	Circuits
Provisioning	Provisions an ONS 15454 SDH card.	DS-N and STM cards: Line, Line Thresholds (different threshold options are available for electrical and optical cards), Elect Path Thresholds, SDH Thresholds, VC4, and Alarm Profiles TXP and MXP cards: Card, Line, Line Thresholds (different threshold options are available for electrical and optical cards), Optics Thresholds, OTN, and Alarm Profiles DWDM cards (subtabs depend on the card type): Optical Line, Optical Chn, Optical Amplifier, Parameters, Optics Thresholds
Maintenance	Performs maintenance tasks for the card.	Loopback, Info, Protection, and J1 Path Trace (options depend on the card type)
Performance	Performs performance monitoring for the card.	DS-N and STM cards: no subtabs TXP and MXP cards: Optics PM, Payload PM, OTN PM DWDM cards (subtabs depend on card type): Optical Line, Optical Chn, Optical Amplifier, Parameters, Optics Thresholds, OTN
Inventory	Displays an Inventory screen of the ports (TXP and MXP cards only).	—

**Note**

For TXP, MXP and DWDM card information, refer to the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

## 8.6 TCC2/TCC2P Card Reset

You can reset the ONS 15454 SDH TCC2/TCC2P card by using CTC (a soft reset) or by physically reseating a TCC2/TCC2P card (a hard reset). A soft reset reboots the TCC2/TCC2P card and reloads the operating system and the application software. Additionally, a hard reset temporarily removes power from the TCC2/TCC2P card and clears all buffer memory.

You can apply a soft reset from CTC to either an active or standby TCC2/TCC2P card without affecting traffic. If you need to perform a hard reset on an active TCC2/TCC2P card, put the TCC2/TCC2P card into standby mode first by performing a soft reset.

**Note**

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When a CTC reset is performed on an active TCC2/TCC2P card, the AIC-I card goes through an initialization process and also resets because the AIC-I card is controlled by the active TCC2/TCC2P.

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## 8.7 TCC2/TCC2P Card Database

When dual TCC2/TCC2P cards are installed in the ONS 15454 SDH, each TCC2/TCC2P card hosts a separate database; therefore, the protect card's database is available if the database on the working TCC2/TCC2P fails. You can also store a backup version of the database on the workstation running CTC. This operation should be part of a regular ONS 15454 SDH maintenance program at approximately weekly intervals, and should also be completed when preparing an ONS 15454 SDH for a pending natural disaster, such as a flood or fire.

**Note**

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The following parameters are not backed up and restored: node name, IP address, mask and gateway, and Internet Inter-ORB Protocol (IPOP) port. If you change the node name and then restore a backed up database with a different node name, the circuits map to the new node name. Cisco recommends keeping a record of the old and new node names.

---

## 8.8 Software Revert

When you click the Activate button after a software upgrade, the TCC2/TCC2P copies the current working database and saves it in a reserved location in the TCC2/TCC2P flash memory. If you later need to revert to the original working software load from the protect software load, the saved database installs automatically. You do not need to restore the database manually or recreate circuits.

**Note**

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The TCC2/TCC2P card does not carry any software earlier than Software R4.0. You will not be able to revert to a software release earlier than Software R4.0 with TCC2/TCC2P cards installed.

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The revert feature is useful if a maintenance window closes while you are upgrading CTC software. You can revert to the protect software load without losing traffic. When the next maintenance window opens, complete the upgrade and activate the new software load.

Circuits created and provisioning done after a software load is activated (upgraded to a higher software release) will be lost with a revert. The database configuration at the time of activation is reinstated after a revert. This does not apply to maintenance reverts (for example, 4.6.2 to 4.6.1), because maintenance releases use the same database.

To perform a supported (non-service-affecting) revert from Software R5.0, the release you want to revert to must have been working at the time you first activated Software R5.0 on that node. Because a supported revert automatically restores the node configuration at the time of the previous activation, any configuration changes made after activation will be lost when you revert the software. Downloading Release 5.0 a second time after you have activated a new load ensures that no actual revert to a previous load can take place (the TCC2/TCC2P will reset, but will not be traffic affecting and will not change your database).



## Security and Timing

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This chapter provides information about Cisco ONS 15454 SDH users and SDH timing. To provision security and timing, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [9.1 Users and Security, page 9-1](#)
- [9.2 Node Timing, page 9-7](#)

### 9.1 Users and Security

The CISCO15 user ID is provided with the ONS 15454 SDH system, but this user ID is not prompted when you sign into Cisco Transport Controller (CTC). This ID can be used to set up other ONS 15454 SDH users. (To do this, complete the “Create Users and Assign Security” procedure in the *Cisco ONS 15454 SDH Procedure Guide*.)

You can have up to 500 user IDs on one ONS 15454 SDH. Each CTC or Transaction Language One (TL1) user can be assigned one of the following security levels:

- Retrieve—Users can retrieve and view CTC information but cannot set or modify parameters.
- Maintenance—Users can access only the ONS 15454 SDH maintenance options.
- Provisioning—Users can access provisioning and maintenance options.
- Superusers—Users can perform all of the functions of the other security levels as well as set names, passwords, and security levels for other users.

By default, multiple concurrent user ID sessions are permitted on the node, that is, multiple users can log into a node using the same user ID. However, you can provision the node to allow only a single login per user and prevent concurrent logins for all users.



**Note**

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You must add the same user name and password to each node the user accesses.

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#### 9.1.1 Security Requirements

[Table 9-1](#) shows the actions that each user privilege level can perform in node view.

Table 9-1 ONS 15454 SDH Security Levels—Node View

CTC Tab	Subtab	[Subtab]:Actions	Retrieve	Maintenance	Provisioning	Superuser
Alarms	—	Synchronize/Filter/Delete Cleared Alarms	X	X	X	X
Conditions	—	Retrieve/Filter	X	X	X	X
History	Session	Filter	X	X	X	X
	Node	Retrieve/Filter	X	X	X	X
Circuits	—	Create/Edit/Delete	—	—	X	X
		Filter/Search	X	X	X	X
Provisioning	General	General: Edit	—	—	Partial <sup>1</sup>	X
		Power Monitor: Edit	—	—	X	X
	Ether Bridge	Spanning trees: Edit	—	—	X	X
	Network	General: Edit	—	—	—	X
		General: View <sup>2</sup>	X	X	X	X
		Static Routing: Create/Edit/ Delete	—	—	X	X
		OSPF: Create/Edit/Delete	—	—	X	X
		RIP: Create/Edit/Delete	—	—	X	X
	Protection	Create/Delete/Edit	—	—	X	X
		View	X	X	X	X
	MS-SPRing	Create/Edit/Delete	—	—	X	X
		Ring Map/Squelch Table/RIP Table	X	X	X	X
	Security	Users: Create/Delete	—	—	—	X
		Users: Change password	Same user	Same user	Same user	All users
		Active Logins: View/Logout	—	—	—	X
		Policy: Edit	—	—	—	X
		Access: Edit	—	—	—	X
Legal Disclaimer: Edit		—	—	—	X	
SNMP	Create/Delete/Edit	—	—	X	X	
	Browse trap destinations	X	X	X	X	



Table 9-1 ONS 15454 SDH Security Levels—Node View (continued)

CTC Tab	Subtab	[Subtab]:Actions	Retrieve	Maintenance	Provisioning	Superuser	
Provisioning	Comm Channels	SDCC: Create/Edit/Delete	—	—	X	X	
		LDCC: Create/Edit/Delete	—	—	X	X	
		GCC: Create/Edit/Delete	—	—	X	X	
		OSC: OSC Terminations: Create/Edit/Delete	—	—	X	X	
		OSC: DWDM Ring ID: Create/Edit/Delete	—	X	X	X	
		Provisionable Patchcords: Create/Delete	—	—	X	X	
	Timing	General: Edit	—	—	X	X	
		BITS Facilities: Edit	—	—	X	X	
	Alarm Profiles	Alarm Behavior: Edit	—	—	X	X	
		Alarm Profiles Editor: Store/Delete <sup>3</sup>	—	—	X	X	
		Alarm Profile Editor: New/Load/Compare/Available/ Usage	X	X	X	X	
	Defaults	Edit/Import	—	—	—	X	
		Reset/Export	X	X	X	X	
	WDM-ANS	Provisioning: Edit/Import	—	—	—	X	
		Provisioning: Reset/Export	X	X	X	X	
		Connections: Create/Edit/Delete/Commit/ Calculate	—	—	X	X	
		Port Status: Launch	—	—	X	X	
	Inventory	—	Delete	—	—	X	X
			Reset	—	X	X	X
	Maintenance	Database	Backup	—	X	X	X
Restore			—	—	—	X	
EtherBridge		Spanning Trees: View	X	X	X	X	
		MAC Table: Retrieve	X	X	X	X	
		MAC Table: Clear/Clear All	—	X	X	X	
		Trunk Utilization: Refresh	X	X	X	X	
		Circuits: Refresh	X	X	X	X	
Protection		Switch/Lock out/Lockon/ Clear/ Unlock	—	X	X	X	
MS-SPRing		Create/Edit/Delete	—	—	X	X	
		Ring Map/Squelch Table/RIP Table	X	X	X	X	

**Table 9-1** ONS 15454 SDH Security Levels—Node View (continued)

CTC Tab	Subtab	[Subtab]:Actions	Retrieve	Maintenance	Provisioning	Superuser
Maintenance	Software	Download	—	X	X	X
		Upgrade/Activate/Revert	—	—	—	X
	Cross-Connect	Cards: Switch/Lock/Unlock	—	X	X	X
		Resource Usage: Delete	—	—	X	X
	Overhead XConnect	View	X	X	X	X
	Diagnostic	Retrieve/Lamp Test	—	X	X	X
	Timing	Source: Edit	—	X	X	X
		Timing Report: View/Refresh	X	X	X	X
	Audit	Retrieve/Archive	—	—	—	X
	Routing Table	Retrieve	X	X	X	X
	RIP Routing Table	Retrieve	X	X	X	X
	Test Access	View	X	X	X	X
	DWDM	APC: Run/Disable/Refresh	—	X	X	X
		WDM Span Check: Retrieve Span Loss values, Reset	X	X	X	X
Power Monitoring: Refresh		X	X	X	X	

1. Provisioner user cannot change node name, contact parameters.
2. IP Address is not viewable for Retrieve, Maintenance, and Provisioning users.
3. The action buttons in the subtab are active for all users, but the actions can be completely performed only by the users assigned with the required security levels.

Table 9-2 shows the actions that each user privilege level can perform in network view.

**Table 9-2** ONS 15454 SDH Security Levels—Network View

CTC Tab	Subtab	[Subtab]: Actions	Retrieve	Maintenance	Provisioning	Superuser
Alarms	—	Synchronize/Filter/Delete cleared alarms	X	X	X	X
Conditions	—	Retrieve/Filter	X	X	X	X
History	—	Filter	X	X	X	X
Circuits	—	Create/Edit/Delete	—	—	X	X
		Filter/Search	X	X	X	X

Table 9-2 ONS 15454 SDH Security Levels—Network View (continued)

CTC Tab	Subtab	[Subtab]: Actions	Retrieve	Maintenance	Provisioning	Superuser
Provisioning	Security	Users: Create/Delete	—	—	—	X
		Users: Change	Same user	Same user	Same user	All users
		Active logins: Logout	—	—	—	X
		Policy: Change	—	—	—	X
	Alarm Profiles	Store/Delete <sup>1</sup>	—	—	X	X
		New/Load/Compare/Available/Usage	X	X	X	X
	MS-SPRing	Create/Delete/Edit/Upgrade	—	—	X	X
	Overhead Circuits	Create/Delete/Edit/Merge	—	—	X	X
		Search	X	X	X	X
Provisionable Patchcords	Create/ Delete	—	—	X	X	
Maintenance	Software	Download/Cancel	X	X	X	X

1. The action buttons in the subtab are active for all users, but the actions can be completely performed only by the users assigned with the required security levels.

## 9.1.2 Security Policies

Users with Superuser security privilege can provision security policies on the ONS 15454 SDH. These security policies include idle user timeouts, password changes, password aging, and user lockout parameters. In addition, a Superuser can prevent users from accessing the ONS 15454 SDH through the TCC2/TCC2P RJ-45 port, the MIC-C/T/P LAN connection, or both.

### 9.1.2.1 Idle User Timeout

Each ONS 15454 SDH CTC or TL1 user can be idle during his or her login session for a specified amount of time before the CTC window is locked. The lockouts prevent unauthorized users from making changes. Higher-level users have shorter default idle periods and lower-level users have longer or unlimited default idle periods, as shown in Table 9-3. The user idle period can be modified by a Superuser; refer to the *Cisco ONS 15454 SDH Procedure Guide* for instructions.

Table 9-3 ONS 15454 SDH Default User Idle Times

Security Level	Idle Time
Superuser	15 minutes
Provisioning	30 minutes
Maintenance	60 minutes
Retrieve	Unlimited

### 9.1.2.2 User Password, Login, and Access Policies

Superusers can view real-time lists of users who are logged into CTC or TL1 by node. Superusers can also provision the following password, login, and node access policies.

- Password expirations and reuse—Superusers can specify when users must change and when they can reuse their passwords.
- Login attempts—Superusers can specify the maximum number of times that users are allowed to attempt to log into CTC.
- Locking out and disabling users—Superusers can provision the number of invalid logins that are allowed before locking out users and the length of time before inactive users are disabled.
- Node access and user sessions—Superusers can limit the number of CTC sessions one user can have, and they can prohibit access to the ONS 15454 SDH using the LAN or MIC-C/T/P connections.

In addition, a Superuser can select secure shell (SSH) instead of Telnet at the CTC Provisioning > Security > Access tabs. SSH is a terminal-remote host Internet protocol that uses encrypted links. It provides authentication and secure communication over unsecure channels. Port 22 is the default port and cannot be changed.



#### Note

The superuser cannot modify the privilege level of an active user. The CTC displays a warning message when the superuser attempts to modify the privilege level of an active user.

### 9.1.2.3 Audit Trail

Audit trails prove useful for maintaining security, recovering lost transactions, and enforcing accountability. Accountability refers to tracing user activities; that is, associating a process or action with a specific user.

The ONS 15454 SDH maintains a 640-entry, human-readable audit trail of user or system actions such as login, logout, circuit creation or deletion, and user- or system-generated actions. Login events include authorized Cisco logins using the ONS 15454 SDH TL1 or the CTC graphical user interface. You can move the log to a local or network drive for later review. The ONS 15454 SDH generates an event to indicate when the log is 80 percent full, and another event to indicate that the oldest log entries are being overwritten.

Table 9-4 contains the columns listed in Audit Trail window.

**Table 9-4**      **Audit Trail Window Columns**

Heading	Explanation
Date	Date when the action occurred
Num	Incrementing count of actions
User	User ID that initiated the action
P/F	Pass/Fail (whether or not the action was executed)
Operation	Action that was taken

## 9.2 Node Timing

SDH timing parameters must be set for each ONS 15454 SDH. Each ONS 15454 SDH independently accepts its timing reference from one of three sources:

- The building integrated timing supply (BITS) pins on the MIC-C/T/P coaxial connectors.
- An STM-N card installed in the ONS 15454 SDH. The card is connected to a node that receives timing through a BITS source.
- The internal ST3 clock on the TCC2/TCC2P card.

You can set ONS 15454 SDH timing to one of three modes: external, line, or mixed. If timing is coming from the BITS pins, set the ONS 15454 SDH timing to external. If the timing comes from an STM-N card, set the timing to line. In typical ONS 15454 SDH networks:

- One node is set to external. The external node derives its timing from a BITS source wired to the BITS MIC-C/T/P coaxial connectors. The BITS source, in turn, derives its timing from a primary reference source (PRS) such as a Stratum 1 clock or global positioning satellite (GPS) signal.
- The other nodes are set to line. The line nodes derive timing from the externally timed node through the STM-N trunk (span) cards. The MSTP normally derives timing from the line using the OSCM or OSC-CSM card that are inside an STM-1 channel.

You can set three timing references for each ONS 15454 SDH. The first two references are typically two BITS-level sources, or two line-level sources optically connected to a node with a BITS source. The third reference is usually assigned to the internal clock provided on every ONS 15454 SDH TCC2/TCC2P card. However, if you assign all three references to other timing sources, the internal clock is always available as a backup timing reference. The internal clock is a Stratum 3 (ST3), so if an ONS 15454 SDH node becomes isolated, timing is maintained at the ST3 level.

The CTC Maintenance > Timing > Report tabs show current timing information for an ONS 15454 SDH, including the timing mode, clock state and status, switch type, and reference data.

**Caution**

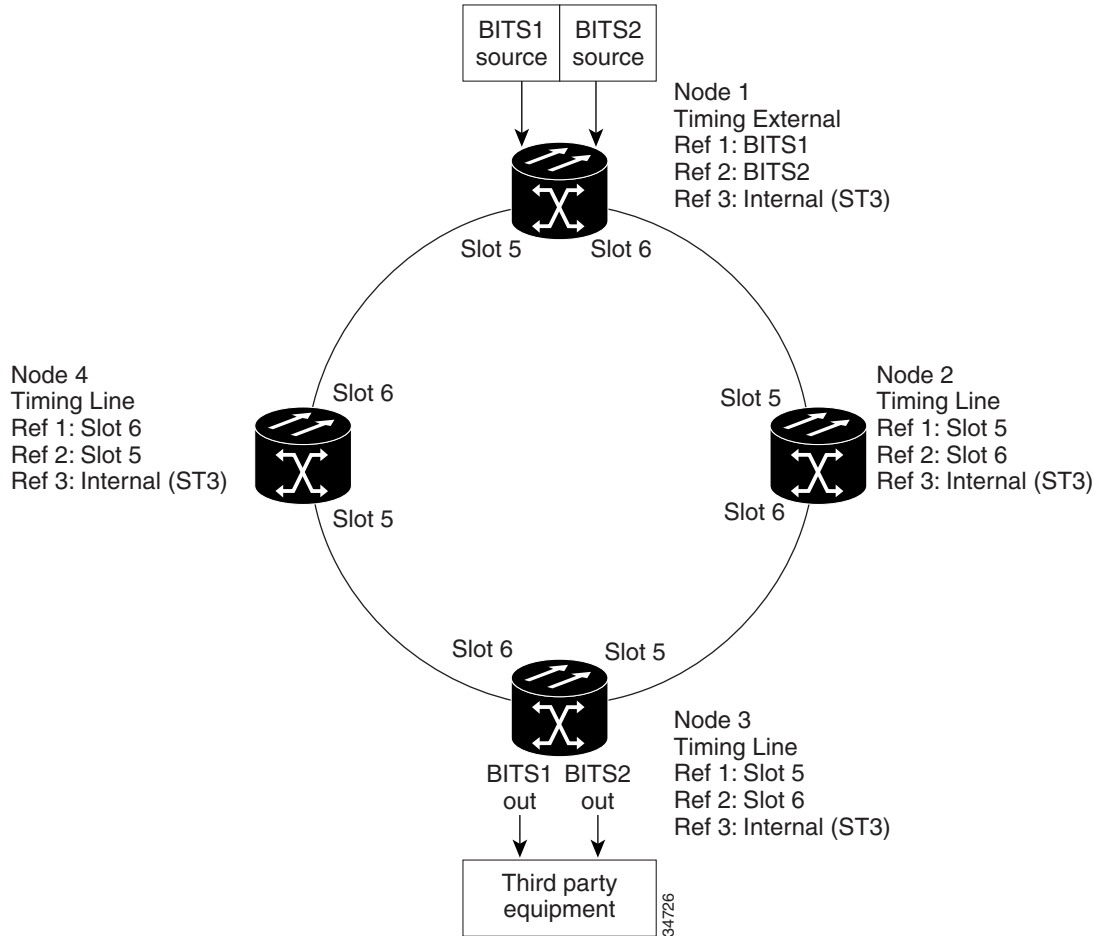
Mixed timing allows you to select both external and line timing sources. However, Cisco does not recommend its use because it can create timing loops. Use this mode with caution.

### 9.2.1 Network Timing Example

[Figure 9-1](#) shows an ONS 15454 SDH network timing setup example. Node 1 is set to external timing. Two timing references are set to BITS. These are Stratum 1 timing sources wired to the BITS MIC-C/T/P coaxial connectors on Node 1. The third reference is set to internal clock. The BITS outputs on Node 3 provide timing to outside equipment, such as a digital access line access multiplexer.

In the example, Slots 5 and 6 contain the trunk (span) cards. Timing at Nodes 2, 3, and 4 is set to line, and the timing references are set to the trunk cards based on distance from the BITS source. Reference 1 is set to the trunk card closest to the BITS source. At Node 2, Reference 1 is Slot 5 because it is connected to Node 1. At Node 4, Reference 1 is set to Slot 6 because it is connected to Node 1. At Node 3, Reference 1 could be either trunk card because they are an equal distance from Node 1.

Figure 9-1 ONS 15454 SDH Timing Example



## 9.2.2 Synchronization Status Messaging

Synchronization status messaging (SSM) is an SDH protocol that communicates information about the quality of the timing source. SSM messages are carried on the S1 byte of the SDH section overhead. They enable SDH devices to automatically select the highest quality timing reference and to avoid timing loops.

SSM messages are either Generation 1 or Generation 2. Generation 1 is the first and most widely deployed SSM message set. Generation 2 is a newer version. If you enable SSM for the ONS 15454 SDH, consult your timing reference documentation to determine which message set to use. [Table 9-5](#) shows the SDH message set.

**Table 9-5** SDH SSM Message Set

Message	Quality	Description
G811	1	Primary reference clock
STU	2	Sync traceability unknown
G812T	3	Transit node clock traceable

**Table 9-5** *SDH SSM Message Set (continued)*

<b>Message</b>	<b>Quality</b>	<b>Description</b>
G812L	4	Local node clock traceable
SETS	5	Synchronous equipment
DUS	6	Do not use for timing synchronization







## Circuits and Tunnels

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This chapter explains Cisco ONS 15454 SDH high-order and low-order circuits; low-order, data communication channel (DCC), and IP-encapsulated tunnels; and virtual concatenated (VCAT) circuits. To provision circuits and tunnels, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [10.1 Overview, page 10-1](#)
- [10.2 Circuit Properties, page 10-2](#)
- [10.3 Cross-Connect Card Bandwidth, page 10-9](#)
- [10.4 DCC Tunnels, page 10-10](#)
- [10.5 Multiple Destinations for Unidirectional Circuits, page 10-12](#)
- [10.6 Monitor Circuits, page 10-12](#)
- [10.7 SNCP Circuits, page 10-12](#)
- [10.8 MS-SPRing Protection Channel Access Circuits, page 10-14](#)
- [10.9 Path Trace, page 10-15](#)
- [10.10 Path Signal Label, C2 Byte, page 10-15](#)
- [10.11 Automatic Circuit Routing, page 10-16](#)
- [10.12 Manual Circuit Routing, page 10-18](#)
- [10.13 Constraint-Based Circuit Routing, page 10-22](#)
- [10.14 Virtual Concatenated Circuits, page 10-22](#)
- [10.15 Merge Circuits, page 10-24](#)
- [10.16 Reconfigure Circuits, page 10-25](#)

### 10.1 Overview

You can create circuits across and within ONS 15454 SDH nodes and assign different attributes to circuits. For example, you can:

- Create one-way, two-way (bidirectional), or broadcast circuits. VC low-order path tunnels (VC\_LO\_PATH\_TUNNEL) are automatically set to bidirectional and do not use multiple drops.
- Assign user-defined names to circuits.
- Assign different circuit sizes.

- Enable port grouping on low-order path tunnels. Three ports form a port group. For example, in one E3-12 or one DS3i-N-12 card, four port groups are available: Ports 1 to 3 = PG1, Ports 4 to 6 = PG2, Ports 7 to 9 = PG3, and Ports 10 to 12 = PG4.




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**Note** CTC shows VC3-level port groups, but the XC10G creates only VC4-level port groups. VC4 tunnels must be used to transport VC3 signal rates.

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**Note** Monitor circuits cannot be created on a VC3 circuit in a port group.

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- Automatically or manually route VC high-order and low-order path circuits.
- Automatically route VC low-order path tunnels.
- Automatically create multiple circuits with autoranging. VC low-order path tunnels do not use autoranging.
- Provide full protection to the circuit path.
- Provide only protected sources and destinations for circuits.
- Define a secondary circuit source or destination that allows you to interoperate an ONS 15454 SDH subnetwork connection protection (SNCP) ring with third-party equipment SNCPs.

You can provision circuits at any of the following points:

- Before cards are installed. The ONS 15454 SDH allows you to provision slots and circuits before installing the traffic cards. (To provision an empty slot, right-click it and select a card from the shortcut menu.) However, circuits cannot carry traffic until you install the cards and place their ports in service. For card installation procedures and ring-related procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*.
- After cards are installed, but before their ports are in service (enabled). You must put the ports in service before circuits can carry traffic.
- After cards are installed and their ports are in service. Circuits carry traffic as soon as the signal is received.

## 10.2 Circuit Properties

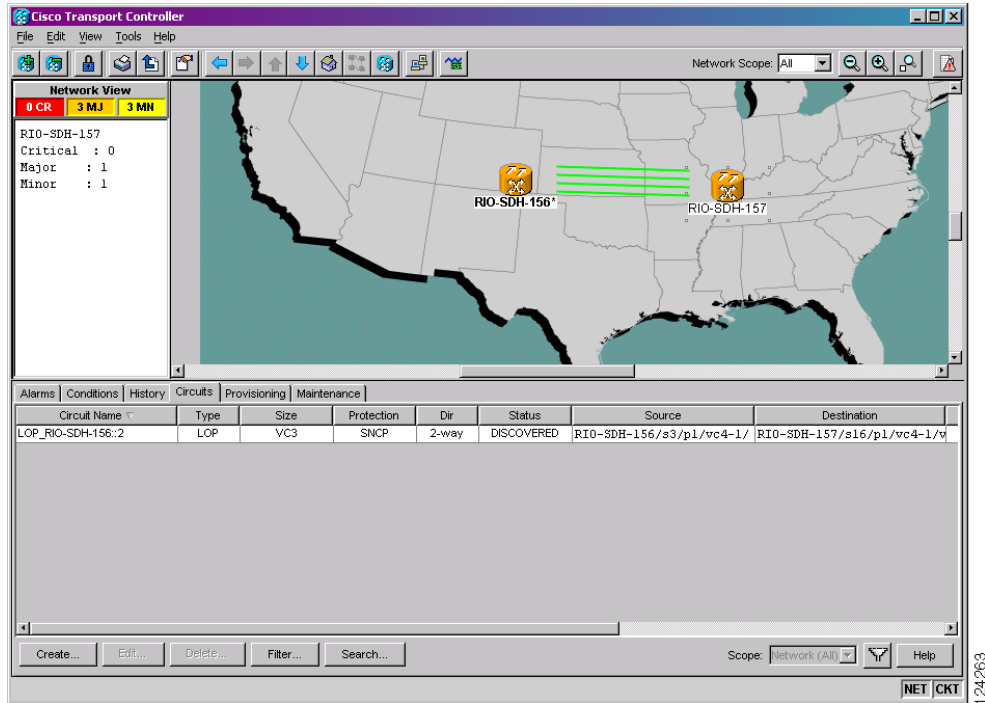
The ONS 15454 SDH Circuits window, which appears in network, node, and card view, is where you can view information about circuits. The Circuits window ([Figure 10-1 on page 10-4](#)) provides the following information:

- **Name**—The name of the circuit. The circuit name can be manually assigned or automatically generated.
- **Type**—Circuit types are HOP (high-order circuit), LOP (low-order circuit), VCT (VC low-order tunnel), VCA (VC low-order aggregation point), OCHNC (dense wavelength division multiplexing [DWDM] optical channel network connection; refer to the refer to the *Cisco ONS 15454 DWDM Installation and Operations Guide*), HOP\_v (high-order virtual concatenated [VCAT] circuit), and LOP\_v (low-order VCAT circuit).
- **Size**—The circuit size. Low-order circuits are VC12 and VC3. High-order circuit sizes are VC4, VC4-2c, VC4-3c, VC4-4c, VC4-8c, VC4-16c, and VC4-64c. OCHNC sizes are Equipped not specific, Multi-rate, 2.5 Gbps No FEC (forward error correction), 2.5 Gbps FEC, 10 Gbps No FEC, and 10 Gbps FEC. High-order VCAT circuits are VC4 and VC4-4c. OCHNCs are DWDM only, refer

to the *Cisco ONS 15454 DWDM Installation and Operations Guide* for more information. Low-order VCAT circuits are VC3. For information on the number of supported members for each card, see [Table 10-12](#).

- OCHNC Wlen—For OCHNCs, the wavelength provisioned for the DWDM optical channel network connection. (DWDM only; refer to the *Cisco ONS 15454 DWDM Installation and Operations Guide* for more information).
- Direction—The circuit direction, either two-way (bidirectional) or one-way.
- OCHNC Dir—For OCHNCs, the direction of the DWDM optical channel network connection, either east to west or west to east. (DWDM only; refer to the *Cisco ONS 15454 DWDM Installation and Operations Guide* for more information).
- Protection—The type of circuit protection. See the “[10.2.3 Circuit Protection Types](#)” section on [page 10-7](#).
- Status—The circuit status. See the “[10.2.1 Circuit Status](#)” section on [page 10-4](#).
- Source—The circuit source in the format: *node/slot/port “port name” virtual container/tributary unit group/tributary unit group/virtual container*. (The port name appears in quotes.) Node and slot always display; *port “port name”/virtual container/tributary unit group/tributary unit group/virtual container* might display, depending on the source card, circuit type, and whether a name is assigned to the port. If the circuit size is a concatenated size (VC4-2c, VC4-4c, VC4-8c, etc.), VCs used in the circuit are indicated by an ellipsis, for example, VC4-7..9 (VCs 7, 8, and 9) or VC4-10..12 (VC 10, 11, and 12).
- Destination—The circuit destination in same format (*node/slot/port “port name”/virtual container/tributary unit group/tributary unit group/virtual container*) as the circuit source.
- # of VLANs—The number of VLANs used by an Ethernet circuit with end points on E-Series Ethernet cards in single-card or multicard mode.
- # of Spans—The number of inter-node links that constitute the circuit. Right-clicking the column displays a shortcut menu from which you can choose to show or hide circuit span detail.
- State—The circuit state. See the “[10.2.2 Circuit States](#)” section on [page 10-5](#).

Figure 10-1 ONS 15454 SDH Circuit Window in Network View



## 10.2.1 Circuit Status

The circuit statuses that appear in the Circuit window Status column are generated by CTC based on conditions along the circuit path. Table 10-1 shows the statuses that can appear in the Status column.

Table 10-1 ONS 15454 SDH Circuit Status

Status	Definition/Activity
CREATING	CTC is creating a circuit.
DISCOVERED	CTC created a circuit. All components are in place and a complete path exists from circuit source to destination.
DELETING	CTC is deleting a circuit.

**Table 10-1**      **ONS 15454 SDH Circuit Status (continued)**

Status	Definition/Activity
PARTIAL	<p>A CTC-created circuit is missing a cross-connect or network span, a complete path from source to destination(s) does not exist, or an alarm interface panel (AIP) change occurred on one of the circuit nodes and the circuit is in need of repair. (AIPs store the node MAC address.)</p> <p>In CTC, circuits are represented using cross-connects and network spans. If a network span is missing from a circuit, the circuit status is PARTIAL. However, a PARTIAL status does not necessarily mean a circuit traffic failure has occurred, because traffic might flow on a protect path.</p> <p>Network spans are in one of two states: up or down. On CTC circuit and network maps, up spans appear as green lines, and down spans appear as gray lines. If a failure occurs on a network span during a CTC session, the span remains on the network map but its color changes to gray to indicate that the span is down. If you restart your CTC session while the failure is active, the new CTC session cannot discover the span and its span line does not appear on the network map.</p> <p>Subsequently, circuits routed on a network span that goes down appear as DISCOVERED during the current CTC session, but appear as PARTIAL to users who log in after the span failure.</p>
DISCOVERED_TL1	A TL1-created circuit or a TL1-like, CTC-created circuit is complete. A complete path from source to destination(s) exists.
PARTIAL_TL1	A TL1-created circuit or a TL1-like, CTC-created circuit is missing a cross-connect or circuit span (network link), and a complete path from source to destination(s) does not exist.
CONVERSION_PENDING	An existing circuit in a topology upgrade is set to this state. The circuit returns to the DISCOVERED status once the in-service topology upgrade is complete. For more information about in-service topology upgrades, see <a href="#">Chapter 11, “SDH Topologies and Upgrades.”</a>
PENDING_MERGE	Any new circuits created to represent an alternate path in a topology upgrade are set to this status to indicate that it is a temporary circuit. These circuits can be deleted if an in-service topology upgrade fails. For more information about in-service topology upgrades, see <a href="#">Chapter 11, “SDH Topologies and Upgrades.”</a>

## 10.2.2 Circuit States

The circuit service state is an aggregate of the cross-connect states within the circuit.

- If all cross-connects in a circuit are in the Unlocked-enabled service state, the circuit service state is Unlocked.

- If all cross-connects in a circuit are in the Locked-enabled,maintenance; Unlocked-disabled,automaticInService; or Locked-enabled,disabled service state, the circuit service state is Locked.
- Partial is appended to the Locked circuit service state when circuit cross-connects state are mixed and not all in the Unlocked-enabled service state. The Locked-partial state can occur during automatic or manual transitions between states. The Locked-partial service state can appear during a manual transition caused by an abnormal event such as a CTC crash or communication error, or if one of the cross-connects could not be changed. Refer to the *Cisco ONS 15454 SDH Troubleshooting Guide* for troubleshooting procedures. The Locked-partial circuit state does not apply to OCHNC circuit types.

The state of a VCAT circuit is an aggregate of its member circuits. An In Group member has cross-connects in the Unlocked-enabled; Unlocked-disabled,automaticInService; or Locked-enabled,maintenance service states. An Out of Group member has cross-connects in the Locked-enabled,disabled; or Locked-enabled,outOfGroup service states. You can view whether a VCAT member is In Group or Out of Group in the VCAT State column on the Edit Circuits window.

- If all member circuits are Unlocked, the VCAT circuit is Unlocked.
- If all In Group member circuits are Locked, the VCAT circuit state is Locked.
- If no member circuits exist or are all Out of Group, the state of a VCAT circuit is Locked.
- A VCAT circuit is Locked-partial when In Group member states are mixed and not all in the Unlocked state.

You can assign a state to circuit cross-connects at two points:

- During circuit creation, you can set the state on the Create Circuit wizard.
- After circuit creation, you can change a circuit state on the Edit Circuit window or from the Tools > Circuits > Set Circuit State menu.

During circuit creation, you can apply a service state to the drop ports in a circuit; however, CTC does not apply a requested state other than Unlocked-enabled to drop ports if:

- The port is a timing source.
- The port is provisioned for orderwire or tunnel orderwire.
- The port is provisioned as a DCC or DCC tunnel.
- The port supports 1+1 or multiplex section-shared protection ring (MS-SPRing).

Circuits do not use the soak timer, but ports do. The soak period is the amount of time that the port remains in the Unlocked-disabled,automaticInService service state after a signal is continuously received. When the cross-connects in a circuit are in the Unlocked-disabled,automaticInService service state, the ONS 15454 SDH monitors the cross-connects for an error-free signal. It changes the state of the circuit from Locked to Unlocked or to Locked-partial as each cross-connect assigned to the circuit path is completed. This allows you to provision a circuit using TL1, verify its path continuity, and prepare the port to go into service when it receives an error-free signal for the time specified in the port soak timer.

To find the remaining port soak time, choose the Maintenance > AINS Soak tabs in card view and click the Retrieve button. If the port is in the Unlocked-disabled,automaticInService state and has a good signal, the Time Until IS column shows the soak count down status. If the port is Unlocked-disabled,automaticInService and has a bad signal, the Time Until IS column indicates that the signal is bad. You must click the Retrieve button to obtain the latest time value.

For more information about cross-connect states, see [Appendix B, “Administrative and Service States.”](#)

## 10.2.3 Circuit Protection Types

The Protection column on the Circuit window shows the card (line) and SDH topology (path) protection used for the entire circuit path. [Table 10-2](#) shows the protection type indicators that appear in this column.

**Table 10-2**      **Circuit Protection Types**

Protection Type	Description
1+1	The circuit is protected by a 1+1 protection group.
2F MS-SPRing	The circuit is protected by a two-fiber MS-SPRing.
4F MS-SPRing	The circuit is protected by a four-fiber MS-SPRing.
2F-PCA	The circuit is routed on a protection channel access (PCA) path on a two-fiber MS-SPRing; PCA circuits are unprotected.
4F-PCA	The circuit is routed on a PCA path on a four-fiber MS-SPRing; PCA circuits are unprotected.
DRI	The circuit is protected by a dual-ring interconnection.
MS-SPRing	The circuit is protected by both a two-fiber and a four-fiber MS-SPRing.
N/A	A circuit with connections on the same node is not protected.
PCA	The circuit is routed on a PCA path on both two-fiber and four-fiber MS-SPRings; PCA circuits are unprotected.
Protected	The circuit is protected by diverse SDH topologies, for example, an MS-SPRing and an SNCP, or an SNCP and a 1+1 protection group.
SNCP	The circuit is protected by an SNCP.
SPLITTER	The circuit is protected by the protect transponder (TXPP_MR_2.5G) splitter protection. For splitter information, refer to the <i>Cisco ONS 15454 DWDM Installation and Operations Guide</i> .
Unknown	A circuit has a source and destination on different nodes and communication is down between the nodes. This protection type appears if not all circuit components are known.
Unprot (black)	A circuit with a source and destination on different nodes is not protected.
Unprot (red)	A circuit created as a fully protected circuit is no longer protected due to a system change, such as removal of a MS-SPRing or 1+1 protection group.
Y-Cable	The circuit is protected by a transponder or muxponder card Y-cable protection group. For more information, refer to the <i>Cisco ONS 15454 DWDM Installation and Operations Guide</i> .

## 10.2.4 Circuit Information in the Edit Circuit Window

The detailed circuit map on the Edit Circuit window allows you to view information about ONS 15454 SDH circuits. Routing information that appears includes:

- Circuit direction (unidirectional/bidirectional)
- The nodes, VC4s, VC3/TUG3, TUG2s, and VC12s through which the circuit passes, including slots and port numbers

- The circuit source and destination points
- Open Shortest Path First (OSPF) area IDs
- Link protection (SNCP, unprotected, MS-SPRing, 1+1) and bandwidth (STM-N)

For MS-SPRings, the detailed map shows the number of MS-SPRing fibers and the MS-SPRing ring ID. For SNCPs, the map shows the active and standby paths from circuit source to destination, and it also shows the working and protect paths. The map indicates nodes set up as dual-ring interconnect nodes. For VCAT circuits, the detailed map is not available for an entire VCAT circuit. However, you can view the detailed map to view the circuit route for each individual member.

You can also view alarms and states on the circuit map, including:

- Alarm states of nodes on the circuit route
- Number of alarms on each node organized by severity
- Port service states on the circuit route
- Alarm state/color of the most severe alarm on the port
- Loopbacks
- Path trace states
- Path selectors states

For example, in an SNCP, the working path is indicated by a green, bidirectional arrow, and the protect path is indicated by a purple, bidirectional arrow. Source and destination ports are shown as circles with an S and a D. Port service states are indicated by colors, shown in [Table 10-3](#).

**Table 10-3** Port State Color Indicators

Port Color	Service State
Green	Unlocked-enabled
Gray	Locked-enabled,disabled
Violet	Unlocked-disabled,automaticInService
Blue (Cyan)	Locked-enabled,maintenance

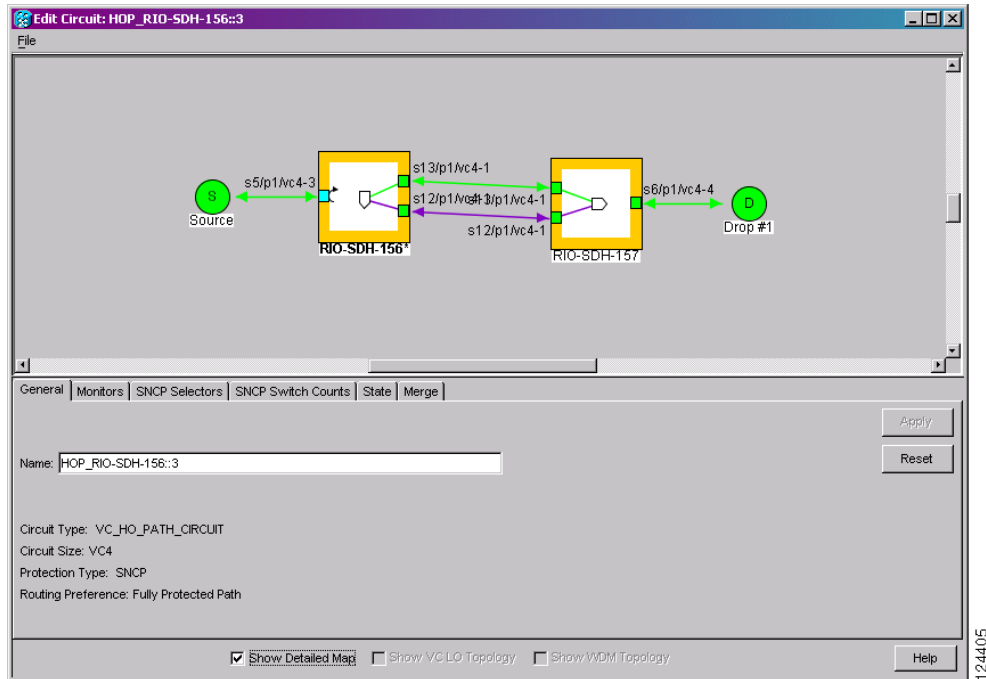
A notation within or by the squares on each node indicates switches and loopbacks, including:

- F = Force switch
- M = Manual switch
- L = Lockout switch
- Arrow = Facility (outward) or terminal (inward) loopback

[Figure 10-2](#) shows an example of an SNCP with a card in terminal loopback in the Edit Circuits window.



Figure 10-2 Terminal Loopback in the Edit Circuits Window



Move the mouse cursor over nodes, ports, and spans to see tooltips with information including the number of alarms on a node (organized by severity), port service state, and the protection topology.

Right-click a node, port, or span on the detailed circuit map to initiate certain circuit actions:

- Right-click a unidirectional circuit destination node to add a drop to the circuit.
- Right-click a port containing a path trace capable card to initiate the path trace.
- Right-click an SNCP span to change the state of the path selectors in the SNCP circuit.

## 10.3 Cross-Connect Card Bandwidth

XC10G cards support high-order cross-connections (VC4 and above at STM-1, STM-4, STM-16, and STM-64 signal rates). The XC10G does not support any low-order circuits such as VC-11, VC-12, and VC3. The XC10G card cross connects standard VC4, VC4-4c, VC4-16c, and VC4-64c signal rates and nonstandard VC4-2c, VC4-3c, and VC4-8c signal rates, providing a maximum of 384 x 384 VC4 cross-connections. Any VC4 on any port can be connected to any other port, meaning that the VC cross-connection capacity is nonblocking. The XC10G card manages up to 192 bidirectional VC4 cross-connections.

VC4 tunnels must be used with the E3-12 and DS3i-N-12 cards to transport VC3 signal rates. Three ports form a port group. For example, in one E3-12 or one DS3i-N-12 card, there are four port groups: Ports 1 to 3 = PG1, Ports 4 to 6 = PG2, Ports 7 to 9 = PG3, and Ports 10 to 12 = PG4.



### Note

In SDH Software R3.4 and earlier, the XC10G does not support VC3 circuits for the E3-12 and DS3i-N-12 cards. You must create a VC tunnel. Refer to the *Cisco ONS 15454 SDH Procedure Guide* for more information.

The XC-VXL-10G and XC-VXL-2.5G card support both low-order and high-order circuits (E-1, E-3, DS-3, STM-1, STM-4, STM-16, and STM-64 signal rates). They manage up to 192 bidirectional STM-1 cross-connects, 192 bidirectional E-3 or DS-3 cross-connects, or 1008 bidirectional E-1 cross-connects.

The XC10G, XC-VXL-10G, and XC-VXL-2.5G cards work with the TCC2/TCC2P card to maintain connections and set up cross-connects within the node. You can create circuits using CTC.



Note

Chapter 2, “Common Control Cards,” contains detailed specifications of the XC10G, XC-VXL-10G, and XC-VXL-2.5G cards.

## 10.4 DCC Tunnels

SDH provides four DCCs for network element operation, administration, maintenance, and provisioning: one on the SDH regenerator section layer (SDCC) and three on the SDH multiplex section layer, also called the line DCC (LDCC). A section DCC (SDCC) and line DCC (LDCC) each provide 192 Kbps of bandwidth per channel. The aggregate bandwidth of the three LDCCs is 576 Kbps. When multiple DCC channels exist between two neighboring nodes, the ONS 15454 SDH balances traffic over the existing DCC channels. You can tunnel third-party SDH equipment across ONS 15454 SDH networks using one of two tunneling methods, a traditional DCC tunnel or an IP-encapsulated tunnel.

### 10.4.1 Traditional DCC Tunnels

In traditional DCC tunnels, the ONS 15454 SDH uses regenerator SDCC for inter-ONS-15454-SDH data communications. It does not use the multiplex section DCCs; therefore, the multiplex SDCCs are available to tunnel DCCs from third-party equipment across ONS 15454 SDH networks. If D4 through D12 are used as data DCCs, they cannot be used for DCC tunneling.

A traditional DCC tunnel endpoint is defined by slot, port, and DCC, where DCC can be either the regenerator SDCC, Tunnel 1, Tunnel 2, or Tunnel 3. You can link a regenerator SDCC to a multiplex SDCC (Tunnel 1, Tunnel 2, or Tunnel 3) and a multiplex SDCC to a regenerator SDCC. You can also link multiplex SDCCs to multiplex SDCCs and link regenerator SDCCs to regenerator SDCCs. To create a DCC tunnel, you connect the tunnel end points from one ONS 15454 SDH STM-N port to another. Cisco recommends a maximum of 84 DCC tunnel connections for an ONS 15454 SDH. [Table 10-4](#) shows the DCC tunnels that you can create.

**Table 10-4** DCC Tunnels

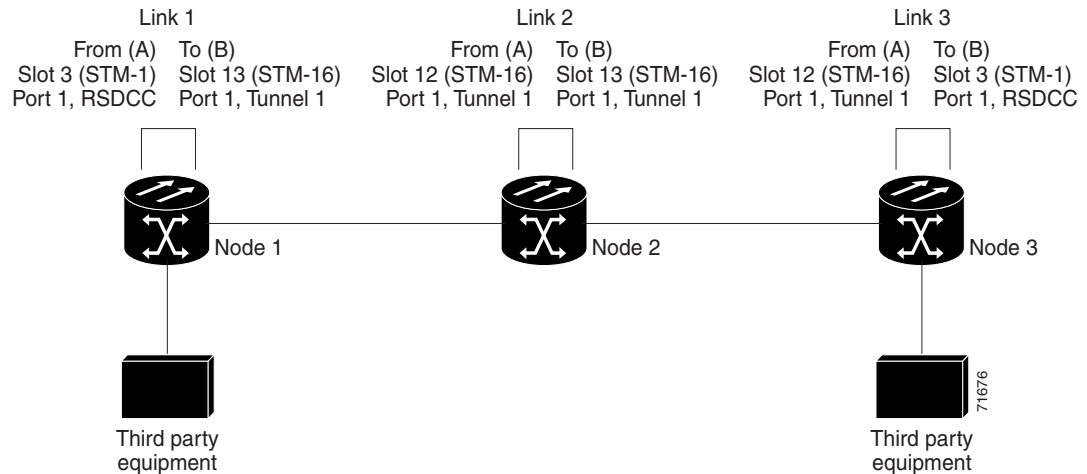
DCC	SDH Layer	SDH Bytes	STM-1 (All Ports)	STM-4, STM-16, STM-64
SDCC	Regenerator Section	D1 to D3	Yes	Yes
Tunnel 1	Multiplex Section	D4 to D6	No	Yes
Tunnel 2	Multiplex Section	D7 to D9	No	Yes
Tunnel 3	Multiplex Section	D10 to D12	No	Yes

[Figure 10-3](#) shows a DCC tunnel example. Third-party equipment is connected to STM-1 cards at Node 1/Slot 3/Port 1 and Node 3/Slot 3/Port 1. Each ONS 15454 SDH node is connected by STM-16 trunk (span) cards. In the example, three tunnel connections are created, one at Node 1 (STM-1 to STM-16), one at Node 2 (STM-16 to STM-16), and one at Node 3 (STM-16 to STM-1).

**Note**

A DCC does not function on a mixed network of ONS 15454 SDH nodes and ONS 15454 nodes. DCC tunneling is required for ONS 15454 SDH nodes transporting data through ONS 15454 nodes.

**Figure 10-3 Traditional DCC Tunnel**



When you create DCC tunnels, keep the following guidelines in mind:

- Each ONS 15454 SDH can have up to 84 DCC tunnel connections.
- Each ONS 15454 SDH can have up to 84 regenerator SDCC terminations.
- A regenerator SDCC that is terminated cannot be used as a DCC tunnel endpoint.
- A regenerator SDCC that is used as a DCC tunnel endpoint cannot be terminated.
- All DCC tunnel connections are bidirectional.

**Note**

A multiplex SDCC cannot be used for tunneling if a data DCC is assigned.

## 10.4.2 IP-Encapsulated Tunnels

An IP-encapsulated tunnel puts an SDCC in an IP packet at a source node and dynamically routes the packet to a destination node. A traditional DCC tunnel is configured as one dedicated path across a network and does not provide a failure recovery mechanism if the path is down. An IP-encapsulated tunnel is a virtual path, which adds protection when traffic travels between different networks.

IP-encapsulated tunneling has the potential of flooding the DCC network with traffic resulting in a degradation of performance for CTC. The data originating from an IP tunnel can be throttled to a user-specified rate, which is a percentage of the total SDCC bandwidth.

Each ONS 15454 SDH supports up to ten IP-encapsulated tunnels. You can convert a traditional DCC tunnel to an IP-encapsulated tunnel or an IP-encapsulated tunnel to a traditional DCC tunnel. Only tunnels in the DISCOVERED status can be converted.

**Caution**

Converting from one tunnel type to the other is service-affecting.

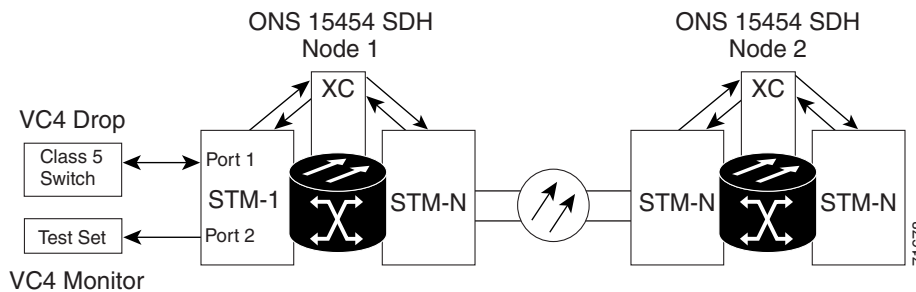
## 10.5 Multiple Destinations for Unidirectional Circuits

Unidirectional circuits can have multiple destinations for use in broadcast circuit schemes. In broadcast scenarios, one source transmits traffic to multiple destinations, but traffic is not returned back to the source. When you create a unidirectional circuit, the card that does not have its backplane receive (Rx) input terminated with a valid input signal generates a loss of signal (LOS) alarm. To mask the alarm, create an alarm profile suppressing the LOS alarm and apply it to the port that does not have its Rx input terminated.

## 10.6 Monitor Circuits

Monitor circuits are secondary circuits that monitor traffic on primary bidirectional circuits. Monitor circuits can be created on E1 or STM-N cards. Figure 10-4 shows an example of a monitor circuit. At Node 1, a VC4 is dropped from Port 1 of an STM-1 card. To monitor the VC4 traffic, test equipment is plugged into Port 2 of the STM-1 card and a monitor circuit to Port 2 is provisioned in CTC. Circuit monitors are one-way. The monitor circuit in Figure 10-4 is used to monitor VC4 traffic received by Port 1 of the STM-1 card.

**Figure 10-4** VC4 Monitor Circuit Received at an STM-1 Port



**Note**

Monitor circuits cannot be used with Ethernet circuits.

## 10.7 SNCP Circuits

Use the Edit Circuits window to change SNCP selectors and switch protection paths. In the SNCP Selectors subtab on the Edit Circuits window, you can:

- View the SNCP circuit's working and protection paths.
- Edit the reversion time.
- Set the hold-off timer.
- Edit the Signal Fail (SF)/Signal Degrade (SD) bit error rate (BER) thresholds.



**Note**

In the SNCP Selectors tab, the SF Ber Level and SD Ber Level columns display "N/A" for those nodes that do not support VC low-order signal BER monitoring. In Software Release 5.0, only the Cisco ONS 15310-CL supports VC low-order signal BER monitoring.

In the SNCP Switch Counts subtab, you can:

- Perform maintenance switches on the circuit selector.
- View switch counts for the selectors.

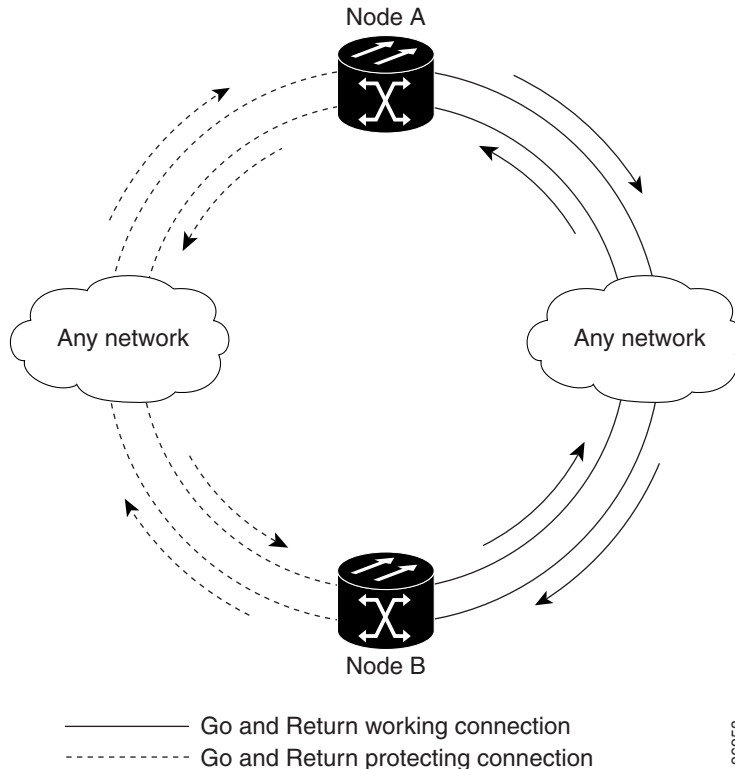
## 10.7.1 Open-Ended SNCP Circuits

If ONS 15454 SDHs are connected to a third-party network, you can create an open-ended SNCP circuit to route a circuit through it. To do this, you create three circuits. One circuit is created on the source ONS 15454 SDH network. This circuit has one source and two destinations, one at each ONS 15454 SDH that is connected to the third-party network. The second circuit is created on the third-party network so that the circuit travels across the network on two paths to the ONS 15454 SDHs. That circuit routes the two circuit signals across the network to ONS 15454 SDHs that are connected to the network on other side. At the destination node network, the third circuit is created with two sources, one at each node connected to the third-party network. A selector at the destination node chooses between the two signals that arrive at the node, similar to a regular SNCP circuit.

## 10.7.2 Go-and-Return SNCP Routing

The go-and-return SNCP routing option allows you to route the SNCP working path on one fiber pair and the protect path on a separate fiber pair (Figure 10-5). The working path will always be the shortest path. If a fault occurs, neither the working fibers nor the protection fibers are affected. This feature only applies to bidirectional SNCP circuits. The go-and-return option appears on the Circuit Attributes panel of the Circuit Creation wizard.

Figure 10-5 SNCP Go-and-Return Routing



## 10.8 MS-SPRing Protection Channel Access Circuits

You can provision circuits to carry traffic on MS-SPRing protection channels when conditions are fault free. Traffic routed on MS-SPRing PCA circuits, called extra traffic, has lower priority than the traffic on the working channels and has no means for protection. During ring or span switches, PCA circuits are preempted and squelched. For example, in a two-fiber STM-16 MS-SPRing, STMs 9 to 16 can carry extra traffic when no ring switches are active, but PCA circuits on these STMs are preempted when a ring switch occurs. When the conditions that caused the ring switch are remedied and the ring switch is removed, PCA circuits are restored if the MS-SPRing is provisioned as revertive.

Provisioning traffic on MS-SPRing protection channels is performed during circuit provisioning. The Protection Channel Access check box appears whenever Fully Protected Path is unchecked on the circuit creation wizard. Refer to the *Cisco ONS 15454 SDH Procedure Guide* for more information. When provisioning PCA circuits, two considerations are important:

- If MS-SPRings are provisioned as nonrevertive, PCA circuits are not restored automatically after a ring or span switch. You must switch the MS-SPRing manually.
- PCA circuits are routed on working channels when you upgrade a MS-SPRing from a two-fiber to a four-fiber or from one STM-N speed to a higher STM-N speed. For example, if you upgrade a two-fiber STM-16 MS-SPRing to an STM-64, STMs 9 to 16 on the STM-16 MS-SPRing become working channels on the STM-64 MS-SPRing.

## 10.9 Path Trace

SDH J1 and J2 path trace are repeated, fixed-length strings composed of 64 consecutive bytes. You can use the strings to monitor interruptions or changes to circuit traffic. [Table 10-5](#) shows the ONS 15454 SDH cards that support J1 path trace. Cards that are not listed in the table do not support the J1 byte.

**Table 10-5** ONS 15454 SDH Cards Capable of Path Trace

J1 Function	Cards
Transmit and receive	E3-12 DS3i-N-12 G-Series ML-Series
Receive only	OC3 IR 4/STM1 SH 1310 OC12/STM4-4 OC48 IR/STM16 SH AS 1310 OC48 LR/STM16 LH AS 1550 OC192 LR/STM64 LH 1550

[Table 10-6](#) shows cards that support J2 path trace.

**Table 10-6** ONS 15454 SDH Cards Capable of J2 Path Trace

J2 Function	Cards
Transmit and Receive	E1-42
Receive Only	STM1E-12

If the string received at a circuit drop port does not match the string the port expects to receive, an alarm is raised. Two path trace modes are available:

- Automatic—The receiving port assumes that the first string it receives is the baseline string.
- Manual—The receiving port uses a string that you manually enter as the baseline string.

## 10.10 Path Signal Label, C2 Byte

One of the overhead bytes in the SDH frame is the C2 byte. The SDH standard defines the C2 byte as the path signal label. The purpose of this byte is to communicate the payload type being encapsulated by the high-order path overhead (HO-POH). The C2 byte functions similarly to EtherType and Logical Link Control (LLC)/Subnetwork Access Protocol (SNAP) header fields on an Ethernet network; it allows a single interface to transport multiple payload types simultaneously. [Table 10-7](#) provides the C2 byte hex values.

**Table 10-7** STM Path Signal Label Assignments for Signals

Hex Code	Content of the STM Synchronous Payload Envelope (SPE)
0x00	Unequipped
0x01	Equipped—nonspecific payload
0x02	Tributary unit group (TUG) structure
0x03	Locked tributary unit (TU-n)
0x04	Asynchronous mapping of 34,368 kbps or 44,736 kbps into container-3 (C-3)
0x12	Asynchronous mapping of 139,264 kbps into container-4 (C-4)
0x13	Mapping for asynchronous transfer mode (ATM)
0x14	Mapping for Distributed Queue Dual Bus (DQDB)
0x15	Asynchronous mapping for Fiber Distributed Data Interface (FDDI)
0xFE	0.181 Test signal (TSS1 to TSS3) mapping SDH network (see ITU-T G.707)
0xFF	Virtual container-alarm indication signal (VC-AIS)

If a circuit is provisioned using a terminating card, the terminating card provides the C2 byte. A low-order path circuit is terminated at the cross-connect card and the cross-connect card generates the C2 byte (0x02) downstream to the VC terminating cards. The cross-connect generates the C2 value (0x02) to the terminating card. If an STM-N circuit is created with no terminating cards, the test equipment must supply the path overhead in terminating mode. If the test equipment is in pass-through mode, the C2 values usually change rapidly between 0x00 and 0xFF. Adding a terminating card to an STM-N circuit usually fixes a circuit having C2 byte problems.

## 10.11 Automatic Circuit Routing

If you select automatic routing during circuit creation, CTC routes the circuit by dividing the entire circuit route into segments based on protection domains. For unprotected segments of circuits provisioned as fully protected, CTC finds an alternate route to protect the segment, creating a virtual SNCP. Each segment of a circuit path is a separate protection domain. Each protection domain is protected in a specific protection scheme including card protection (1+1, 1:1, etc.) or SDH topology (SNCP, MS-SPRing, etc.).

The following list provides principles and characteristics of automatic circuit routing:

- Circuit routing tries to use the shortest path within the user-specified or network-specified constraints. Low-order tunnels are preferable for low-order circuits because low-order tunnels are considered shortcuts when CTC calculates a circuit path in path-protected mesh networks.
- If you do not choose Fully Path Protected during circuit creation, circuits can still contain protected segments. Because circuit routing always selects the shortest path, one or more links and/or segments can have some protection. CTC does not look at link protection while computing a path for unprotected circuits.
- Circuit routing does not use links that are down. If you want all links to be considered for routing, do not create circuits when a link is down.
- Circuit routing computes the shortest path when you add a new drop to an existing circuit. It tries to find the shortest path from the new drop to any nodes on the existing circuit.



- If the network has a mixture of low-order-capable nodes and low-order-incapable nodes, CTC might automatically create a low-order tunnel. Otherwise, CTC asks you whether or not a low-order tunnel is needed.

## 10.11.1 Bandwidth Allocation and Routing

Within a given network, CTC routes circuits on the shortest possible path between source and destination based on the circuit attributes, such as protection and type. CTC considers using a link for the circuit only if the link meets the following requirements:

- The link has sufficient bandwidth to support the circuit.
- The link does not change the protection characteristics of the path.
- The link has the required time slots to enforce the same time slot restrictions for MS-SPRing.

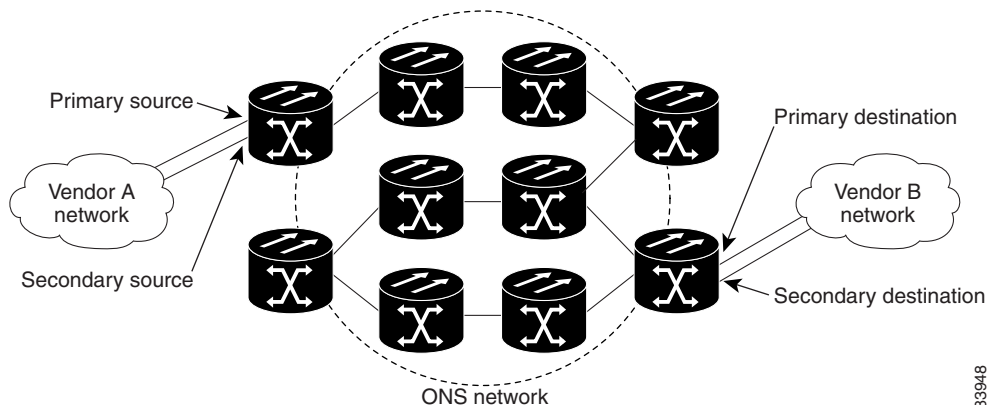
If CTC cannot find a link that meets these requirements, an error appears.

The same logic applies to low-order circuits on low-order tunnels. Circuit routing typically favors low-order tunnels because low-order tunnels are shortcuts between a given source and destination. If the low-order tunnel in the route is full (no more bandwidth), CTC asks whether you want to create an additional low-order tunnel.

## 10.11.2 Secondary Sources and Destinations

CTC supports secondary sources and destinations (drops). Secondary sources and destinations typically interconnect two “foreign” networks (Figure 10-6). Traffic is protected while it goes through a network of ONS 15454 SDHs.

**Figure 10-6** Secondary Sources and Destinations



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Several rules apply to secondary sources and destinations:

- CTC does not allow a secondary destination for unidirectional circuits, because you can always specify additional destinations after you create the circuit.
- Primary and secondary sources should be on the same node.
- Primary and secondary destinations should be on the same node.
- Secondary sources and destinations are permitted only for regular high-order or low-order connections (not for low-order tunnels and multicard EtherSwitch circuits).

- For point-to-point (straight) Ethernet circuits, only VC endpoints can be specified as multiple sources or drops.

For bidirectional circuits, CTC creates an SNCP connection at the source node that allows traffic to be selected from one of the two sources on the ONS 15454 SDH network. If you check the Fully Path Protected option during circuit creation, traffic is protected within the ONS 15454 SDH network. At the destination, another SNCP connection is created to bridge traffic from the ONS 15454 SDH network to the two destinations. A similar but opposite path exists for the reverse traffic flowing from the destinations to the sources. For unidirectional circuits, an SNCP drop-and-continue connection is created at the source node.

## 10.12 Manual Circuit Routing

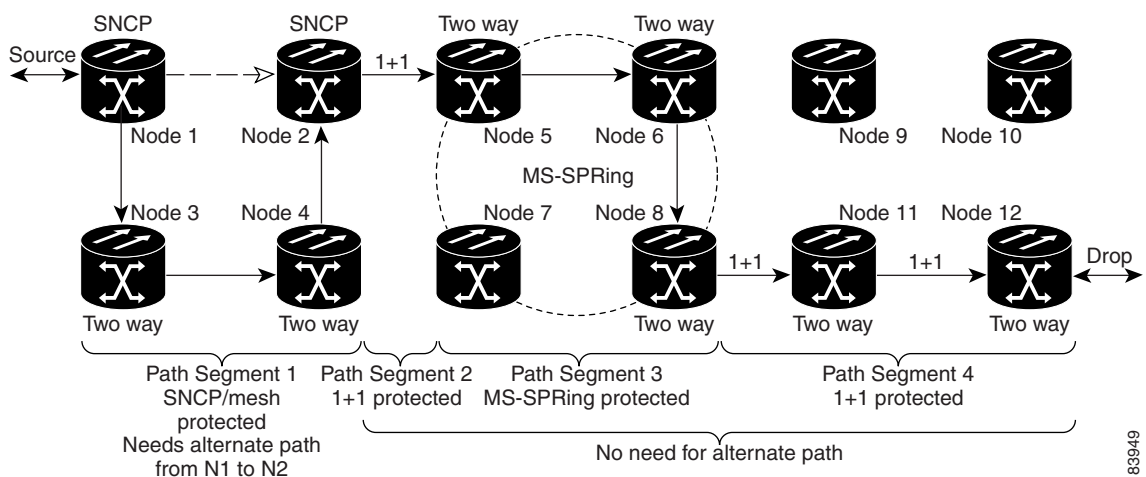
Routing circuits manually allows you to:

- Choose a specific path, not necessarily the shortest path.
- Choose a specific VC4/VC3/TUG3/TUG2/VC12 on each link along the route.
- Create a shared packet ring for multcard EtherSwitch circuits.
- Choose a protected path for multcard EtherSwitch circuits, allowing virtual SNCP segments.

CTC imposes the following rules on manual routes:

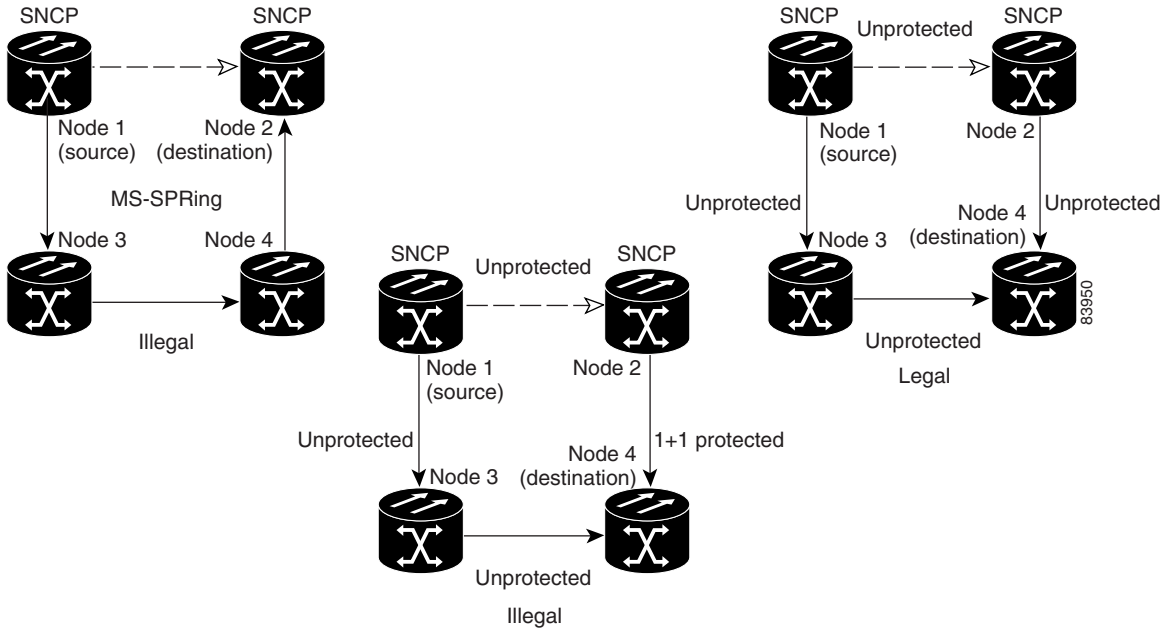
- All circuits, except multcard EtherSwitch circuits in a shared packet ring, should have links with a direction that flows from source to destination. This is true for multcard EtherSwitch circuits that are not in a shared packet ring.
- If you enabled Fully Path Protected, choose a diverse protect (alternate) path for every unprotected segment (Figure 10-7).

**Figure 10-7** Alternate Paths for Virtual SNCP Segments



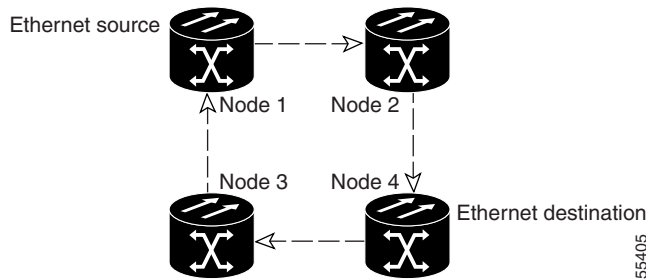
- For multcard EtherSwitch circuits, the Fully Path Protected option is ignored.
- For a node that has an SNCP selector based on the links chosen, the input links to the SNCP selectors cannot be 1+1 or MS-SPRing protected (Figure 10-8). The same rule applies at the SNCP bridge.

**Figure 10-8** *Mixing 1+1 or MS-SPRing Protected Links with an SNCP*



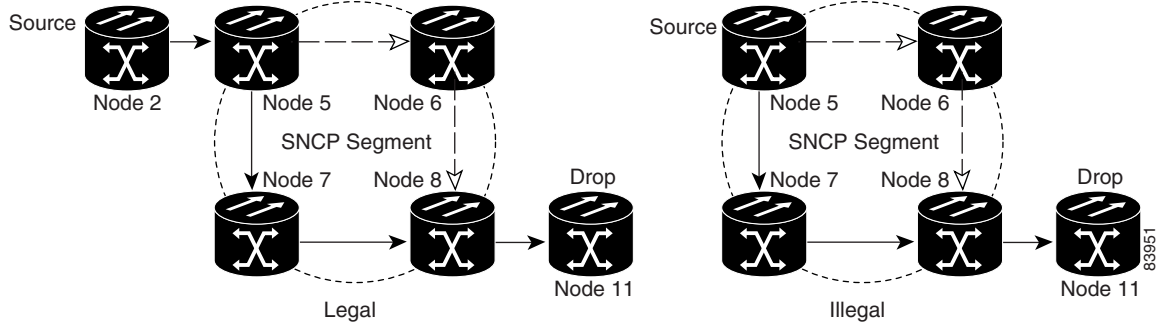
- Choose the links of multcard EtherSwitch circuits in a shared packet ring to route from source to destination back to source (Figure 10-9). Otherwise, a route (set of links) chosen with loops is invalid.

**Figure 10-9** *Ethernet Shared Packet Ring Routing*



- Multicard EtherSwitch circuits can have virtual SNCP segments if the source or destination is not in the SNCP domain. This restriction also applies after circuit creation; therefore, if you create a circuit with SNCP segments, Ethernet drops cannot exist anywhere on the SNCP segment (Figure 10-10).

Figure 10-10 Ethernet and SNCP



- Low-order tunnels cannot be the endpoint of an SNCP segment. A SNCP segment endpoint is where the SNCP selector resides.

If you provision full path protection, CTC verifies that the route selection is protected at all segments. A route can have multiple protection domains with each domain protected by a different scheme.

Table 10-8 through Table 10-11 on page 10-21 summarize the available node connections. Any other combination is invalid and generates an error.

**Table 10-8 Bidirectional VC/TUG/Regular Multicard EtherSwitch/Point-to-Point (Straight) Ethernet Circuits**

Connection Type	Number of Inbound Links	Number of Outbound Links	Number of Sources	Number of Drops
SNCP	—	2	1	—
SNCP	2	—	—	1
SNCP	2	1	—	—
SNCP	1	2	—	—
SNCP	1	—	—	2
SNCP	—	1	2	—
Double SNCP	2	2	—	—
Double SNCP	2	—	—	2
Double SNCP	—	2	2	—
Two way	1	1	—	—
Ethernet	0 or 1	0 or 1	Ethernet node source	—
Ethernet	0 or 1	0 or 1	—	Ethernet node drop

**Table 10-9 Unidirectional Circuit**

Connection Type	Number of Inbound Links	Number of Outbound Links	Number of Sources	Number of Drops
One way	1	1	—	—
SNCP head end	1	2	—	—
SNCP head end	—	2	1	—
SNCP drop and continue	2	—	—	1+

**Table 10-10 Multicard Group Ethernet Shared Packet Ring Circuit**

Connection Type	Number of Inbound Links	Number of Outbound Links	Number of Sources	Number of Drops
<b>Intermediate Nodes Only</b>				
SNCP	2	1	—	—
SNCP	1	2	—	—
Double SNCP	2	2	—	—
Two way	1	1	—	—
<b>Source or Destination Nodes Only</b>				
Ethernet	1	1	—	—

**Table 10-11 Bidirectional Low-Order Tunnels**

Number of Inbound Links	Number of Outbound Links	Number of Sources	Number of Drops	Connection Type
<b>Intermediate Nodes Only</b>				
2	1	—	—	SNCP
1	2	—	—	SNCP
2	2	—	—	Double SNCP
1	1	—	—	Two way
<b>Source Nodes Only</b>				
—	1	—	—	Low-order tunnel endpoint
<b>Destination Nodes Only</b>				
1	—	—	—	Low-order tunnel endpoint

Although virtual SNCP segments are possible in low-order tunnels, low-order tunnels are still considered unprotected. If you need to protect low-order circuits, use two independent low-order tunnels that are diversely routed or use a low-order tunnel that is routed over 1+1, MS-SPRing, or a mixture of 1+1 and MS-SPRing links.

## 10.13 Constraint-Based Circuit Routing

When you create circuits, you can choose Fully Protected Path to protect the circuit from source to destination. The protection mechanism used depends on the path CTC calculates for the circuit. If the network is composed entirely of MS-SPRing or 1+1 links, or the path between source and destination can be entirely protected using 1+1 or MS-SPRing links, no path-protected mesh network (Extended SNCP) or virtual SNCP protection is used.

If Extended SNCP protection is needed to protect the path, set the level of node diversity for the Extended SNCP portions of the complete path in the Circuit Creation dialog box:

- **Nodal Diversity Required**—Ensures that the primary and alternate paths of each Extended SNCP domain in the complete path have a diverse set of nodes.
- **Nodal Diversity Desired**—CTC looks for a node diverse path; if a node-diverse path is not available, CTC finds a link-diverse path for each Extended SNCP domain in the complete path.
- **Link Diversity Only**—Creates only a link-diverse path for each Extended SNCP domain.

When you choose automatic circuit routing during circuit creation, you have the option to require or exclude nodes and links in the calculated route. You can use this option to:

- **Simplify manual routing**, especially if the network is large and selecting every span is tedious. You can select a general route from source to destination and allow CTC to fill in the route details.
- **Balance network traffic**; by default CTC chooses the shortest path, which can load traffic on certain links while other links have most of their bandwidth available. By selecting a required node or a link, you force the CTC to use (or not use) an element, resulting in more efficient use of network resources.

CTC considers required nodes and links to be an ordered set of elements. CTC treats the source nodes of every required link as required nodes. When CTC calculates the path, it makes sure the computed path traverses the required set of nodes and links and does not traverse excluded nodes and links.

The required nodes and links constraint is only used during the primary path computation and only for Extended SNCP domains/segments. The alternate path is computed normally; CTC uses excluded nodes/links when finding all primary and alternate paths on Extended SNCPs.

## 10.14 Virtual Concatenated Circuits

Virtual concatenated (VCAT) circuits, also called VCAT groups (VCGs), transport traffic using noncontiguous time division multiplexing (TDM) time slots, avoiding the bandwidth fragmentation problem that exists with contiguous concatenated circuits. The cards that support VCAT circuits are the FC\_MR-4 (both enhanced and line rate mode), ML-100T, and ML-1000 cards.

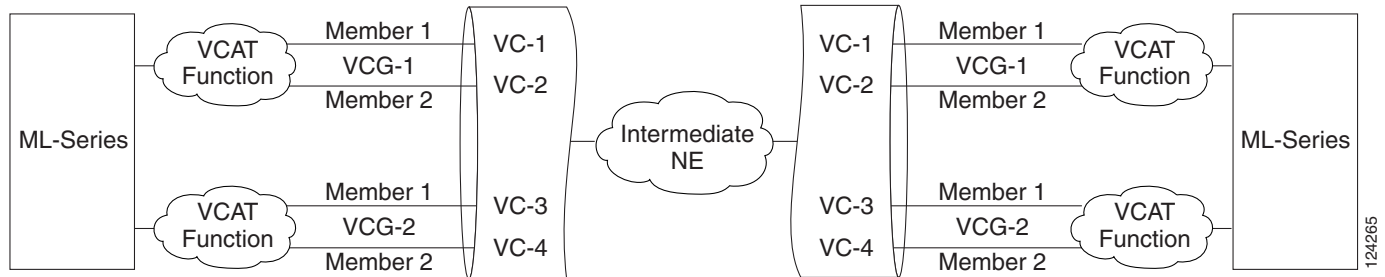
In a VCAT circuit, circuit bandwidth is divided into smaller circuits called VCAT members. The individual members act as independent TDM circuits. All VCAT members should be the same size and must originate/terminate at the same end points. For two-fiber MS-SPRing configurations, some members can be routed on protected time slots and others on PCA time slots.

### 10.14.1 VCAT Member Routing

The automatic and manual routing selection applies to the entire VCAT circuit, that is, all members are manually or automatically routed. Bidirectional VCAT circuits are symmetric, which means that the same number of members travel in each direction. With automatic routing, you can specify the

constraints for individual members; with manual routing, you can select different spans for different members. The FC\_MR-4 and ML-Series cards support common fiber routing. In common fiber routing, all VCAT members travel on the same fibers, which eliminates delay between members. Three protection options are available for common fiber routing: Fully Protected, PCA, and Unprotected. Each member can use a different protection scheme; however, CTC checks the combination to make sure a valid route exists and if it does not, the user must modify the protection type. Figure 10-11 shows an example of common fiber routing.

Figure 10-11 VCAT Common Fiber Routing



## 10.14.2 Software-Link Capacity Adjustment

The FC\_MR-4 (enhanced mode), ML100T, and ML-1000 cards support Software-Link Capacity Adjustment Scheme (SW-LCAS), which uses legacy SONET failure indicators like the AIS-P and RDI-P to detect member failure. If used, SW-LCAS removes the failed member from the VCAT circuit for the duration of the failure, leaving the remaining members to carry the traffic. When the failure clears, the member circuit is added back into the VCAT circuit. SW-LCAS cannot autonomously remove members that have defects in the H4/Z7 byte. SW-LCAS is only available for legacy SONET defects such as AIS-P, LOP-P, etc. SW-LCAS is optional. You can select SW-LCAS during VCAT circuit creation. The FC\_MR-4 card in line rate mode does not support SW-LCAS.

SW-LCAS allows circuit pairing for ML-Series cards over two-fiber MS-SPRing. With circuit pairing, a VCAT circuit is set up between two ML-Series cards: one is a protected circuit (line protection) and the other is PCA. For four-fiber MS-SPRing, member protection cannot be mixed.

In addition, you can create non-LCAS VCAT circuits, which do not use SW-LCAS. While SW-LCAS member cross-connects can be in different service states, all In Group non-LCAS members must have cross-connects in the same service state. A non-LCAS circuit can mix Out of Group and In Group members, as long as the In Group members are in the same service state. Non-LCAS members do not support the Locked-enabled,outOfGroup service state; to put a non-LCAS member in the Out of Group VCAT state, use Locked-enabled,disabled.

## 10.14.3 VCAT Circuit Size

Table 10-12 lists supported circuit rates and number of members for each card.

**Table 10-12** ONS 15454 SDH Card VCAT Circuit Rates and Members

Card	Circuit Rate	Number of Members
FC_MR-4 (Line rate mode)	VC4	8 (1-Gbps port)
		16 (2-Gbps port)
FC_MR-4 (Enhanced mode)	VC4	1–8 (1-Gbps port)
		1–16 (2-Gbps port)
ML-Series	VC3, VC4, VC4-4c	2

Use the Members tab on the Edit Circuit window to add or delete members from a VCAT circuit. The capability to add or delete members depends on the card and if the VCAT circuit is SW-LCAS:

- FC\_MR-4 (enhanced mode) card—You can add or delete SW-LCAS VCAT members, although it might affect service. Before deleting a member, Cisco recommends that you put the member in the Locked-enabled,outOfGroup service state. You cannot add or delete members from VCAT circuits without SW-LCAS.
- FC\_MR-4 (line rate mode) card—All VCAT circuits using FC\_MR-4 (line rate mode) cards have a fixed number of members; you cannot add or delete members.
- ML-Series card—All VCAT circuits using ML-Series cards have a fixed number of members; you cannot add or delete members.

Table 10-13 summarizes the VCAT capabilities for each card.

**Table 10-13** ONS 15454 SDH VCAT Card Capabilities

Card	Mode	Add a Member	Delete a Member	Support Locked-enabled, outOfGroup
FC_MR-4 (enhanced mode)	SW-LCAS	Yes	Yes	Yes
	Non-LCAS	No	No	No
FC_MR-4 (line mode)	Non-LCAS	No	No	No
ML-Series	SW-LCAS	No	No	No
	Non-LCAS	No	No	No

## 10.15 Merge Circuits

A circuit merge combines a single selected circuit with one or more circuits. You can merge VCTs, VCA circuits, VLAN-assigned circuits, CTC-created circuits, and TL1-created circuits. To merge circuits, you choose a circuit on the CTC Circuits tab window and the circuits that you want to merge with the chosen (master) circuit on the Merge tab in the Edit Circuits window. The Merge tab shows only the circuits that are available for merging with the master circuit:

- Circuit cross-connects must create a single, contiguous path.
- Circuits types must be compatible. For example, you can combine a HOP with a VCA circuit to create a longer VCA circuit, but you cannot combine a LOP with a HOP.
- Circuit directions must be compatible. You can merge a one-way and a two-way circuit, but not two one-way circuits in opposing directions.



- Circuit sizes must be identical.
- VLAN assignments must be identical.
- Circuit end points must send or receive the same framing format.
- The merged circuits must become a DISCOVERED circuit.

If all connections from the master circuit and all connections from the merged circuits align to form one complete circuit, the merge is successful. If all connections from the master circuit and some, but not all, connections from the other circuits align to form a single complete circuit, CTC notifies you and gives you the chance to cancel the merge process. If you choose to continue, the aligned connections merge successfully into the master circuit, and unaligned connections remain in the original circuits.

All connections from the master circuit and at least one connection from the other selected circuits must be used in the resulting circuit for the merge to succeed. If a merge fails, the master circuit and all other circuits remain unchanged. When the circuit merge completes successfully, the resulting circuit retains the name of the master circuit.

## 10.16 Reconfigure Circuits

You can reconfigure multiple circuits, which is typically necessary when a large number of circuits are in the PARTIAL state. When reconfiguring multiple circuits, the selected circuits can be any combination of DISCOVERED, PARTIAL, DISCOVERED\_TL1, or PARTIAL\_TL1 circuits. You can reconfigure VCTs, VCA circuits, VLAN-assigned circuits, CTC-created circuits, and TL1-created circuits.

Use the CTC Tools > Circuits > Reconfigure Circuits command to reconfigure selected circuits. During reconfiguration, CTC reassembles all connections of the selected circuits into circuits based on path size, direction, and alignment. Some circuits might merge and others might split into multiple circuits. If the resulting circuit is a valid circuit, it appears as a DISCOVERED circuit. Otherwise, the circuit appears as a PARTIAL or PARTIAL\_TL1 circuit.

**Note**

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PARTIAL tunnel and PARTIAL VLAN-capable circuits do not split into multiple circuits during reconfiguration.

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# SDH Topologies and Upgrades

This chapter explains Cisco ONS 15454 SDH topologies and upgrades. To provision topologies, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [11.1 SDH Rings and TCC2/TCC2P Cards, page 11-1](#)
- [11.2 Multiplex Section-Shared Protection Rings, page 11-2](#)
- [11.3 Subnetwork Connection Protection, page 11-13](#)
- [11.4 Dual Ring Interconnect, page 11-18](#)
- [11.5 Subtending Rings, page 11-26](#)
- [11.6 Linear ADM Configurations, page 11-28](#)
- [11.7 Extended SNCP Mesh Networks, page 11-29](#)
- [11.8 Four Node Configurations, page 11-31](#)
- [11.9 STM-N Speed Upgrades, page 11-31](#)

## 11.1 SDH Rings and TCC2/TCC2P Cards

[Table 11-1](#) shows the SDH rings that can be created on each ONS 15454 SDH node using redundant TCC2/TCC2P cards.

**Table 11-1**      *ONS 15454 SDH Rings with Redundant TCC2/TCC2P Cards*

Ring Type	Maximum Rings per Node
MS-SPRings <sup>1</sup>	5
2-Fiber MS-SPRings	5
4-Fiber MS-SPRings	1
SNCP with SDCC	34 <sup>2 3</sup>
SNCP with LDCC	14 <sup>4 5</sup>
SNCP with LDCC and SDCC	26 <sup>6</sup>

1. MS-SPRing = multiplex section-shared protection ring
2. Total SDCC usage must be equal to or less than 84 SDCCs.
3. See the “[11.3 Subnetwork Connection Protection](#)” section on [page 11-13](#).
4. Total LDCC usage must be equal to or less than 28 LDCCs.

5. See the “[11.3 Subnetwork Connection Protection](#)” section on page 11-13.
6. Total LDCC and SDCC usage must be equal to or less than 84. When LDCC is provisioned, an SDCC termination is allowed on the same port, but is not recommended. Using SDCC and LDCC on the same port is only needed during a software upgrade if the other end of the link does not support LDCC. You can provision SDCCs and LDCCs on different ports in the same node.

## 11.2 Multiplex Section-Shared Protection Rings

There are two types of MS-SPRings: two-fiber and four-fiber. Two-fiber MS-SPRings share service and protection equally, but only two physical fibers are required. For more information, see the “[11.2.1 Two-Fiber MS-SPRings](#)” section on page 11-2. With four-fiber MS-SPRings, the nodes on both sides of the failed span perform a span switch and use the second pair of fibers as the new working route. For more information, see the “[11.2.2 Four-Fiber MS-SPRings](#)” section on page 11-6.

The ONS 15454 SDH can support five concurrent MS-SPRings in one of the following configurations:

- Five two-fiber MS-SPRings
- Four two-fiber and one four-fiber MS-SPRings

Each MS-SPRing can have up to 32 ONS 15454 SDH nodes. Because the working and protect bandwidths must be equal, you can create only STM-4 (two-fiber only), STM-16, or STM-64 MS-SPRings. For information about MS-SPRing protection channels, see the “[10.8 MS-SPRing Protection Channel Access Circuits](#)” section on page 10-14.




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**Note** MS-SPRings with 16 or fewer nodes have a switch time of 50ms. MS-SPRings with 16 or more nodes have a switch time of 100 ms.

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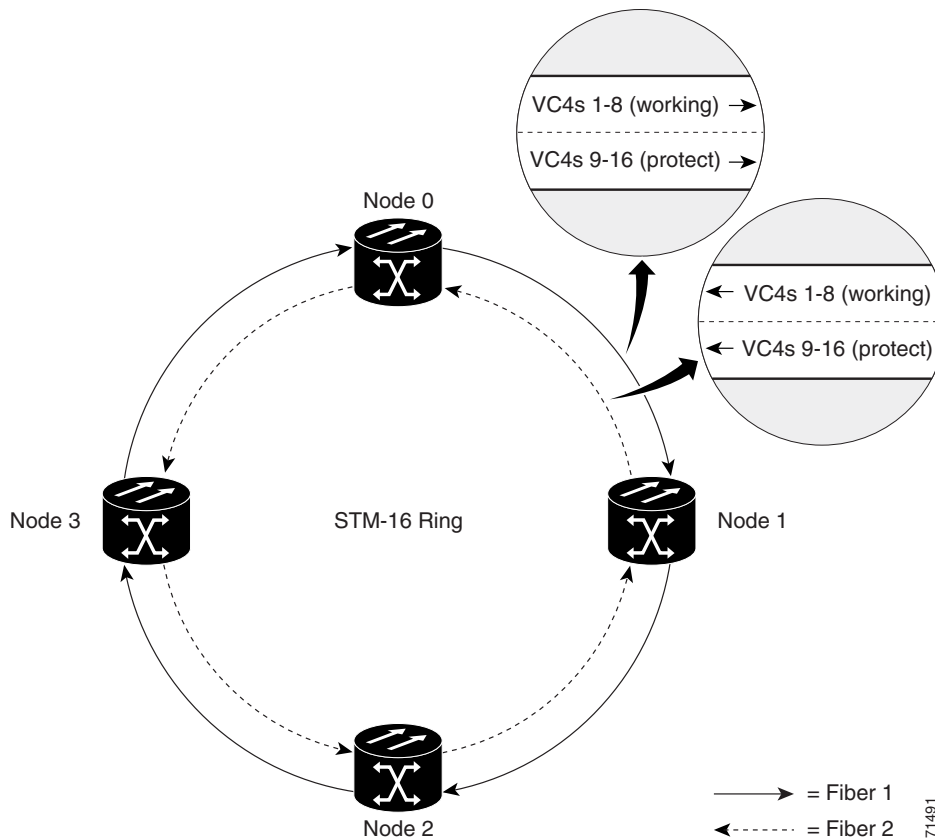
**Note** For best performance, MS-SPRings should have one LAN connection for every ten nodes in the MS-SPRing.

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### 11.2.1 Two-Fiber MS-SPRings

In two-fiber MS-SPRings, each fiber is divided into working and protect bandwidths. For example, in an STM-16 MS-SPRing ([Figure 11-1](#)), VC4s 1 to 8 carry the working traffic, and VC4s 9 to 16 are reserved for protection. Working traffic (VC4s 1 to 8) travels in one direction on one fiber and in the opposite direction on the second fiber. The Cisco Transport Controller (CTC) circuit routing routines calculate the “shortest path” for circuits based on many factors, including user requirements, traffic patterns, and distance. For example, in [Figure 11-1](#), circuits going from Node 0 to Node 1 typically travel on Fiber 1, unless that fiber is full, in which case circuits are routed on Fiber 2 through Node 3 and Node 2. Traffic from Node 0 to Node 2 (or Node 1 to Node 3), can be routed on either fiber, depending on circuit provisioning requirements and traffic loads.

Figure 11-1 Four-Node, Two-Fiber MS-SPRing



The SDH K1, K2, and K3 bytes carry the information that governs MS-SPRing protection switches. Each MS-SPRing node monitors the K bytes to determine when to switch the SDH signal to an alternate physical path. The K bytes communicate failure conditions and actions taken between nodes in the ring. If a break occurs on one fiber, working traffic targeted for a node beyond the break switches to the protect bandwidth on the second fiber. The traffic travels in a reverse direction on the protect bandwidth until it reaches its destination node. At that point, traffic is switched back to the working bandwidth.

Figure 11-2 shows a sample traffic pattern on a four-node, two-fiber MS-SPRing.

**Figure 11-2** Four-Node, Two-Fiber MS-SPRing Traffic Pattern

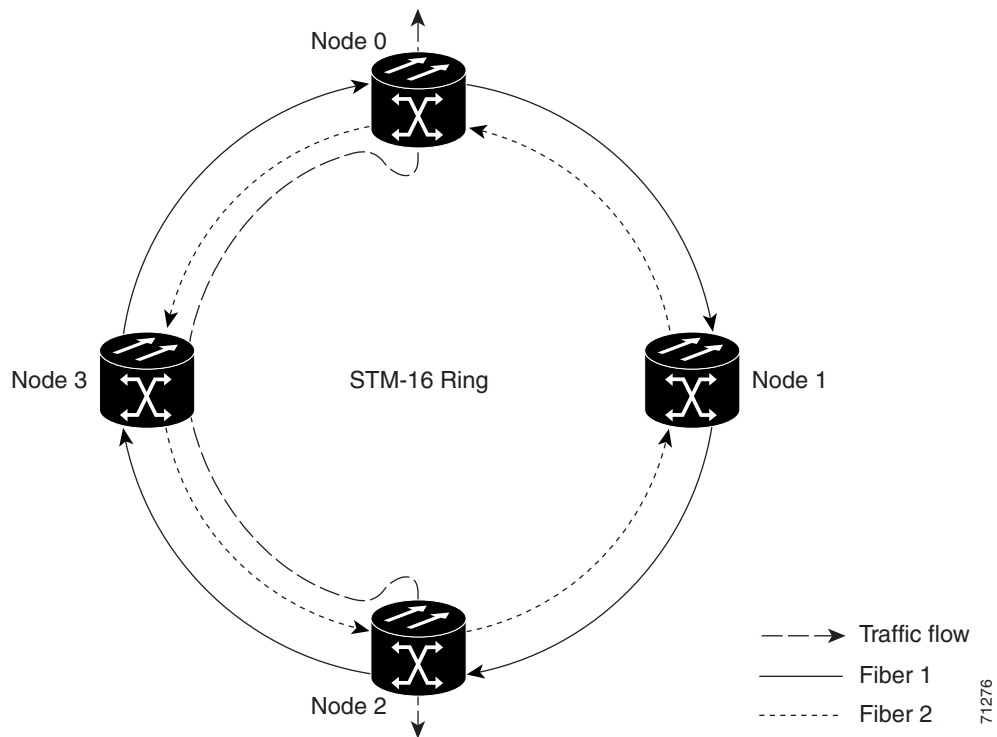
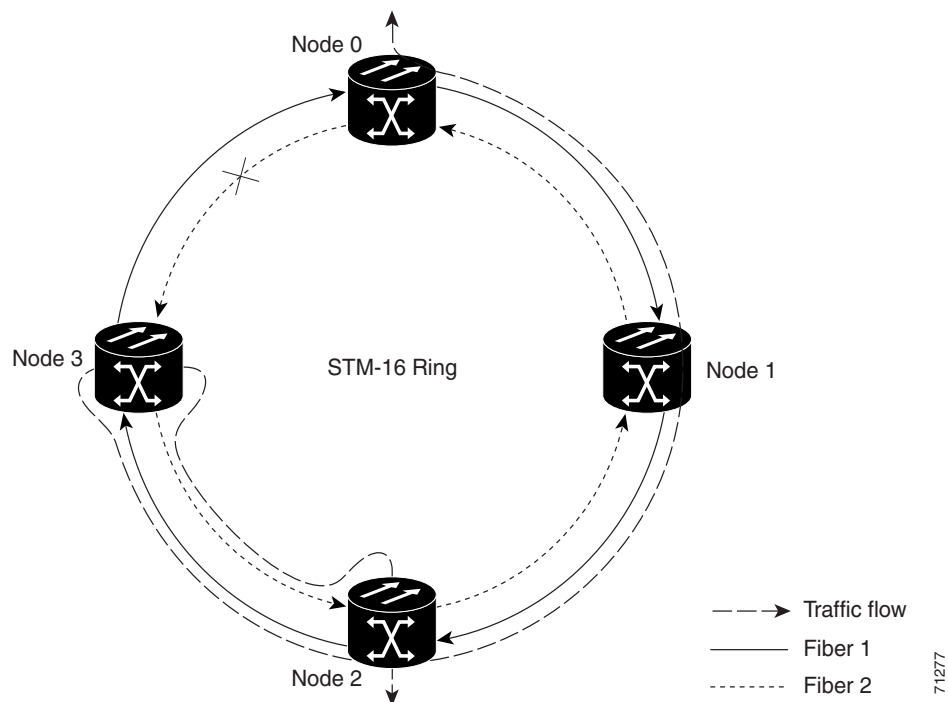


Figure 11-3 shows how traffic is rerouted after a line break between Node 0 and Node 3.

- All circuits originating on Node 0 and carried to Node 2 on Fiber 2 are switched to the protect bandwidth of Fiber 1. For example, a circuit carried on VC4-1 on Fiber 2 is switched to VC4-9 on Fiber 1. A circuit carried on VC4-2 on Fiber 2 is switched to VC4-10 on Fiber 1. Fiber 1 carries the circuit to Node 3 (the original routing destination). Node 3 switches the circuit back to VC4-1 on Fiber 2 where it is routed to Node 2 on VC4-1.
- Circuits originating on Node 2 that were normally carried to Node 0 on Fiber 1 are switched to the protect bandwidth of Fiber 2 at Node 3. For example, a circuit carried on VC4-2 on Fiber 1 is switched to VC4-10 on Fiber 2. Fiber 2 carries the circuit to Node 0 where the circuit is switched back to VC4-2 on Fiber 1 and then dropped to its destination.

**Figure 11-3** Four-Node, Two-Fiber MS-SPRing Traffic Pattern After Line Break

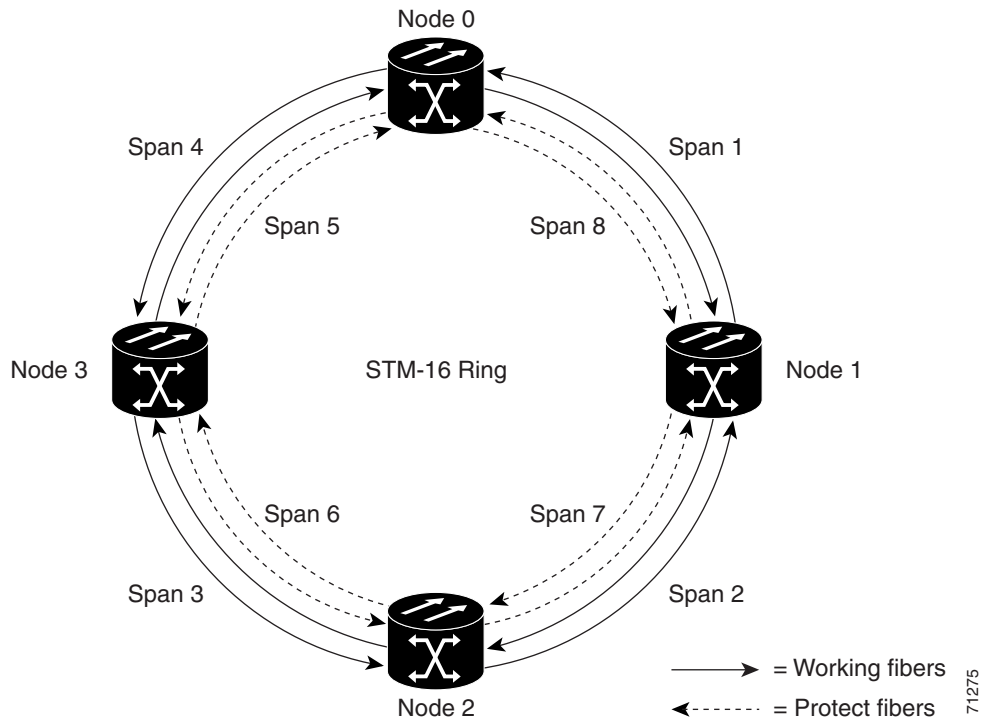


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## 11.2.2 Four-Fiber MS-SPRings

Four-fiber MS-SPRings double the bandwidth of two-fiber MS-SPRings. Because they allow span switching as well as ring switching, four-fiber MS-SPRings increase the reliability and flexibility of traffic protection. Two fibers are allocated for working traffic and two fibers for protection, as shown in [Figure 11-4](#). To implement a four-fiber MS-SPRings, you must install four STM-16 cards or four STM-64 cards at each MS-SPRings node.

**Figure 11-4** Four-Node, Four-Fiber MS-SPRings

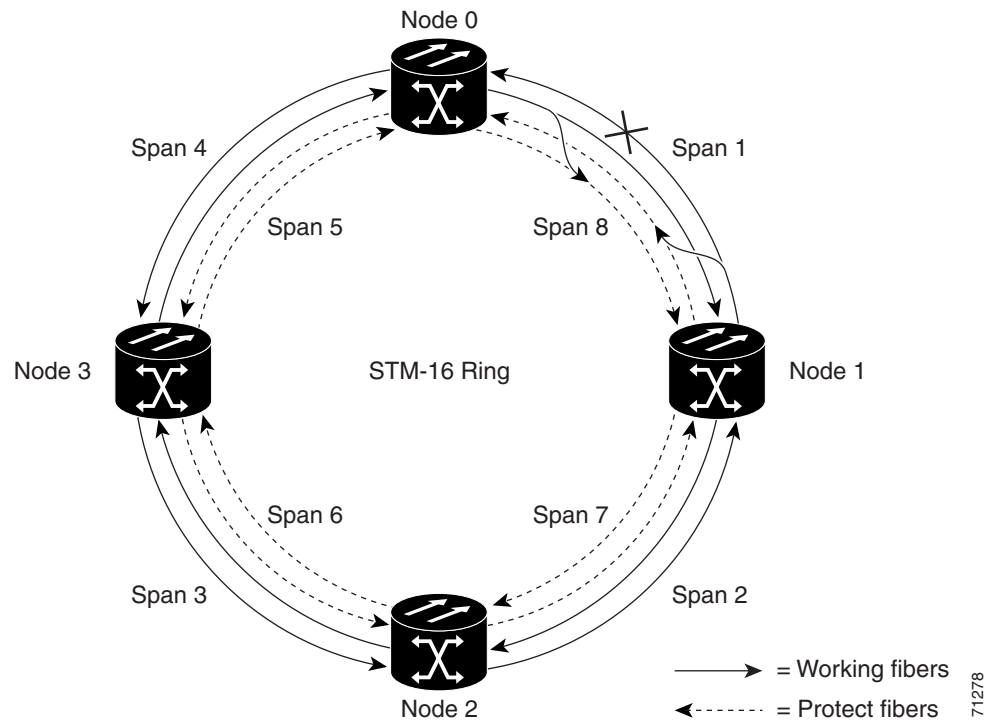




Four-fiber MS-SPRings provide span and ring switching.

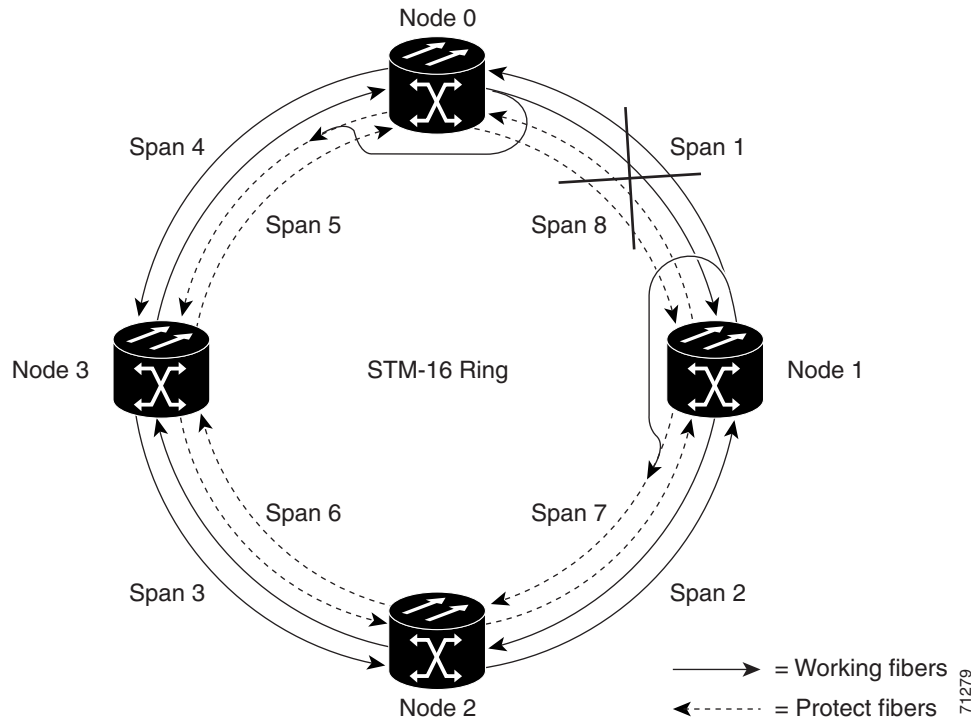
Span switching occurs when a working span fails (Figure 11-5). Traffic switches to the protect fibers between the nodes (Node 0 and Node 1 in the Figure 11-5 example) and then returns to the working fibers that did not fail. Multiple span switches can occur at the same time.

**Figure 11-5** Four-Fiber MS-SPRing Span Switch



Ring switching occurs when a span switch cannot recover traffic (Figure 11-6), such as when both the working and protect fibers fail on the same span. In a ring switch, traffic is routed to the protect fibers throughout the full ring.

Figure 11-6 Four-Fiber MS-SPRing Switch



## 11.2.3 MS-SPRing Bandwidth

An MS-SPRing node can terminate traffic it receives from either side of the ring. Therefore, MS-SPRings are suited for distributed node-to-node traffic applications such as interoffice networks and access networks.

MS-SPRings share the ring bandwidth equally between working and protection traffic. Half of the payload bandwidth is reserved for protection in each direction, making the communication pipe half-full under normal operation.

MS-SPRings allow bandwidth to be reused around the ring and can carry more traffic than a network with traffic flowing through one central hub. MS-SPRings can also carry more traffic than an SNCP ring operating at the same STM-N rate. Table 11-2 shows the bidirectional bandwidth capacities of two-fiber MS-SPRings. The capacity is the STM-N rate divided by two, multiplied by the number of nodes in the ring and minus the number of pass-through VC4 circuits.

Table 11-2 Two-Fiber MS-SPRing Capacity

STM Rate	Working Bandwidth	Protection Bandwidth	Ring Capacity
STM-4	VC4 1-2	VC4 3-4	$2 \times N^1 - PT^2$

**Table 11-2 Two-Fiber MS-SPRing Capacity (continued)**

STM Rate	Working Bandwidth	Protection Bandwidth	Ring Capacity
STM-16	VC4 1-8	VC4 9-16	$8 \times N - PT$
STM-64	VC4 1-32	VC4 33-64	$32 \times N - PT$

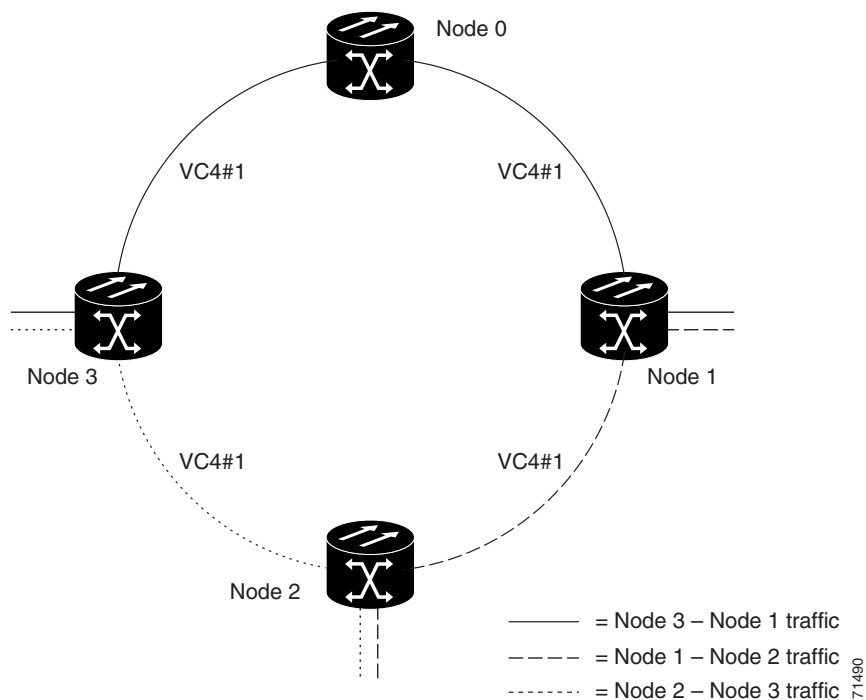
1. N equals the number of ONS 15454 SDH nodes configured as MS-SPRing nodes.
2. PT equals the number of VC4 circuits passed through ONS 15454 SDH nodes in the ring. (Capacity can vary depending on the traffic pattern.)

Table 11-3 shows the bidirectional bandwidth capacities of four-fiber MS-SPRings.

**Table 11-3 Four-Fiber MS-SPRing Capacity**

STM Rate	Working Bandwidth	Protection Bandwidth	Ring Capacity
STM-16	VC4 1-16 (Fiber 1)	VC4 1-16 (Fiber 2)	$16 \times N - PT$
STM-64	VC4 1-64 (Fiber 1)	VC4 1-64 (Fiber 2)	$64 \times N - PT$

Figure 11-7 shows an example of MS-SPRing bandwidth reuse. The same VC4 carries three different traffic sets simultaneously on different spans on the ring: one set from Node 3 to Node 1, one set from Node 1 to Node 2, and another set from Node 2 to Node 3.

**Figure 11-7 MS-SPRing Bandwidth Reuse**

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## 11.2.4 MS-SPRing Application Sample

Figure 11-8 shows a sample two-fiber MS-SPRing implementation with five nodes. A regional long-distance network connects to other carriers at Node 0. Traffic is delivered to the service provider's major hubs.

- Carrier 1 delivers six E-3s over two STM-1 spans to Node 0. Carrier 2 provides twelve E-3s directly. Node 0 receives the signals and delivers them around the ring to the appropriate node.
- The ring also brings 14 E-1s back from each remote site to Node 0. Intermediate nodes serve these shorter regional connections.
- The ONS 15454 SDH STM-1 card supports a total of four STM-1 ports so that two additional STM-1 spans can be added at little cost.

Figure 11-8 Five-Node, Two-Fiber MS-SPRing

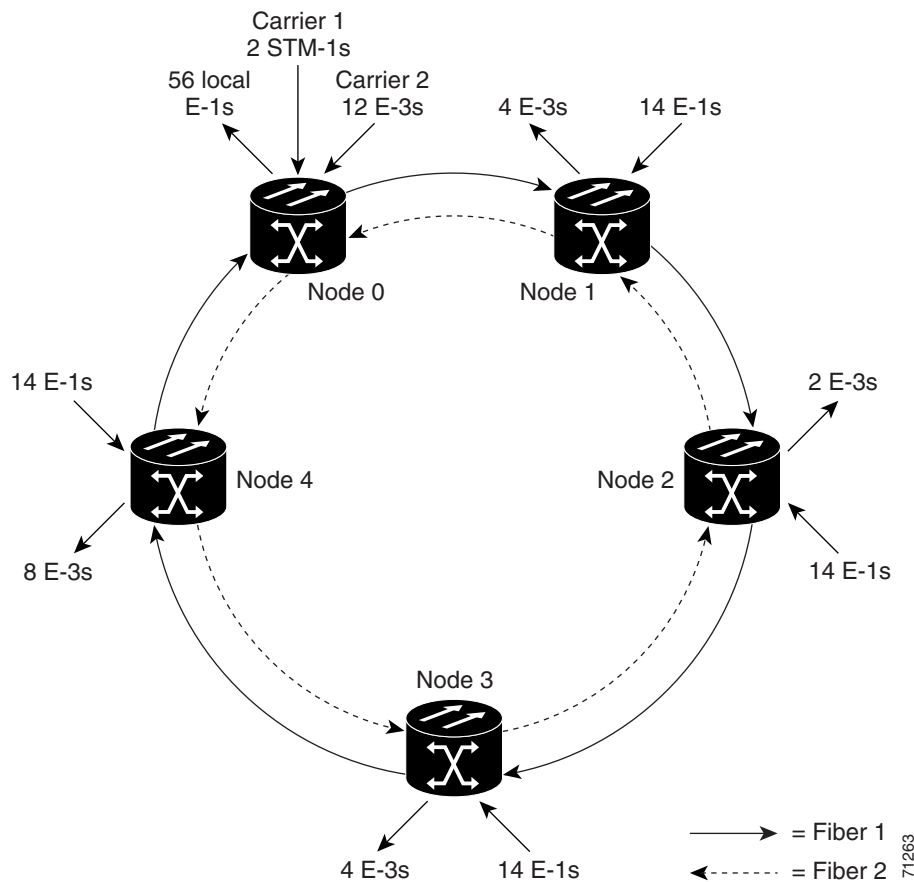


Figure 11-9 shows the shelf assembly layout for Node 0, which has one free slot.

**Figure 11-9 Shelf Assembly Layout for Node 0 in Figure 11-8**

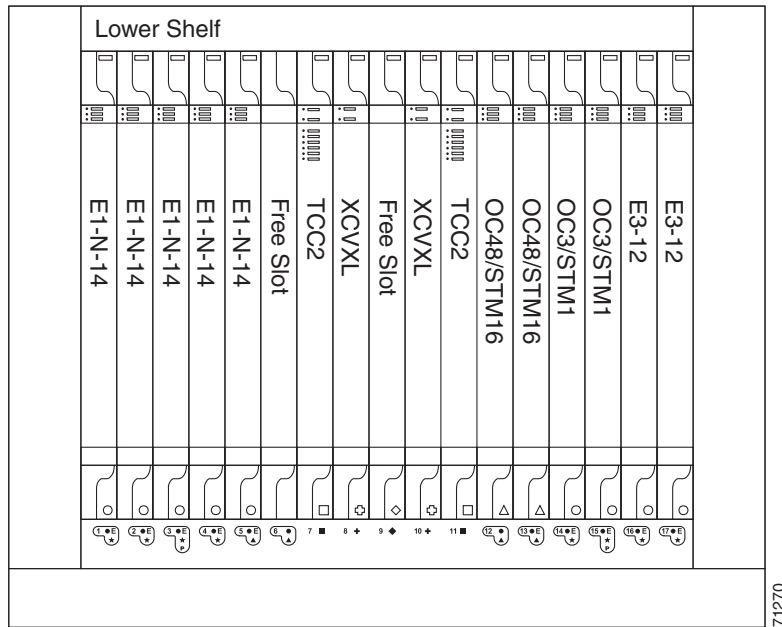
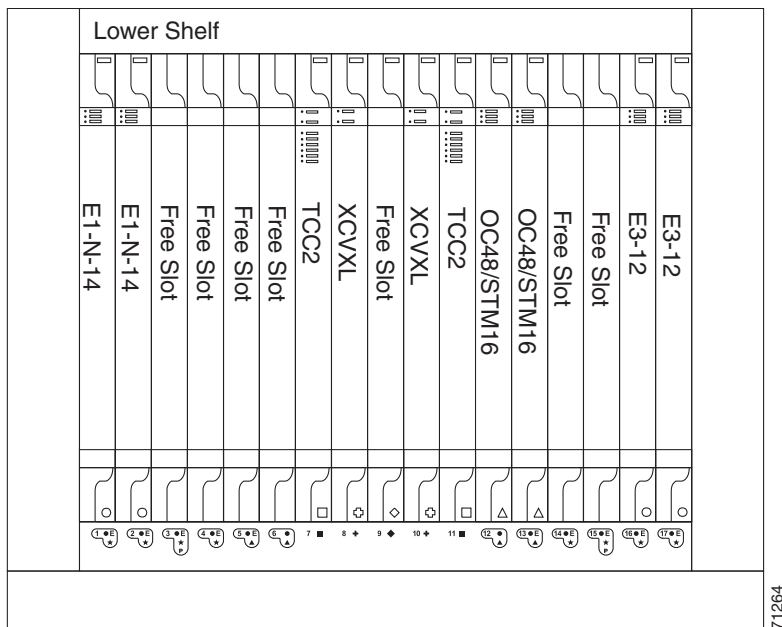


Figure 11-10 shows the shelf assembly layout for the remaining sites in the ring. In this MS-SPRing configuration, an additional eight E-3s at Node IDs 1 and 3 can be activated. An additional four E-3s can be added at Node ID 4, and ten E-3s can be added at Node ID 2. Each site has free slots for future traffic needs.

**Figure 11-10 Shelf Assembly Layout for Nodes 1 to 4 in Figure 11-8**



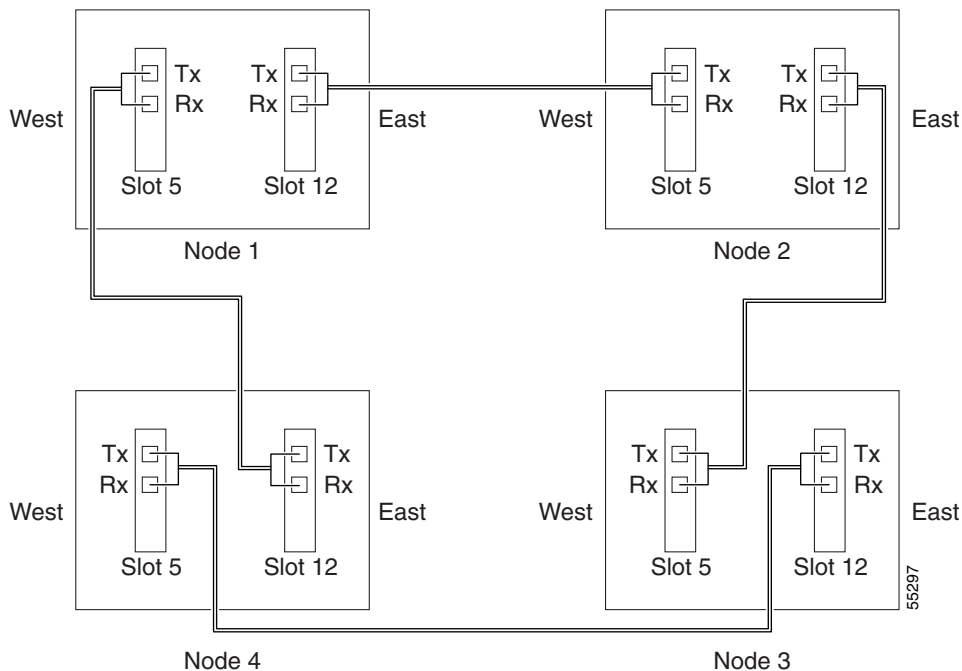
## 11.2.5 MS-SPRing Fiber Connections

Plan your fiber connections and use the same plan for all MS-SPRing nodes. For example, make the east port the farthest slot to the right and the west port the farthest slot to the left. Plug fiber connected to an east port at one node into the west port on an adjacent node. [Figure 11-11](#) shows fiber connections for a two-fiber MS-SPRing with trunk cards in Slot 5 (west) and Slot 12 (east). Refer to the *Cisco ONS 15454 SDH Procedure Guide* for fiber connection procedures.



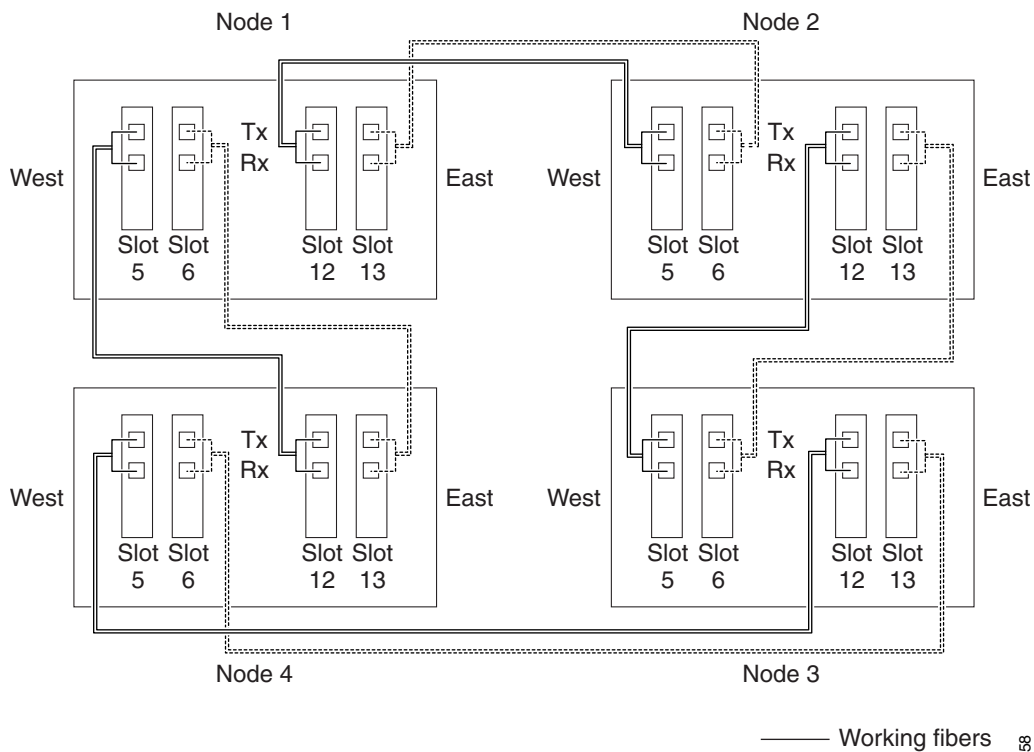
**Note** Always plug the transmit (Tx) connector of an STM-N card at one node into the receive (Rx) connector of an STM-N card at the adjacent node. Cards display an SF LED when Tx and Rx connections are mismatched.

**Figure 11-11** Connecting Fiber to a Four-Node, Two-Fiber MS-SPRing



For four-fiber MS-SPRings, use the same east-west connection pattern for the working and protect fibers. Do not mix working and protect card connections. The MS-SPRing does not function if working and protect cards are interconnected. [Figure 11-12](#) shows fiber connections for a four-fiber MS-SPRing. Slot 5 (west) and Slot 12 (east) carry the working traffic. Slot 6 (west) and Slot 13 (east) carry the protect traffic.

Figure 11-12 Connecting Fiber to a Four-Node, Four-Fiber MS-SPRing



## 11.2.6 Two-Fiber MS-SPRing to Four-Fiber MS-SPRing Conversion

Two-fiber STM-16 or STM-64 MS-SPRings can be converted to four-fiber MS-SPRings. To convert the MS-SPRing, install two STM-16 or STM-64 cards at each two-fiber MS-SPRing node, then log into CTC and convert each node from two-fiber to four-fiber. The fibers that were divided into working and protect bandwidths for the two-fiber MS-SPRing are now fully allocated for working MS-SPRing traffic. Refer to the *Cisco ONS 15454 SDH Procedure Guide* for MS-SPRing conversion procedures.

## 11.3 Subnetwork Connection Protection

Subnetwork connection protection (SNCP) rings provide duplicate fiber paths in the network. Working traffic flows in one direction and protection traffic flows in the opposite direction. If a problem occurs in the working traffic path, the receiving node switches to the path coming from the opposite direction. With SNCP ring networks, switching occurs at the end of the path and is triggered by defects or alarms along the path.

The network can be divided into a number of interconnected subnetworks. Within each subnetwork, protection is provided at the path level and the automatic protection switching between two paths is provided at the subnetwork boundaries. The node at the end of the path and the intermediate nodes in the path select the best traffic signal. The virtual container is not terminated at the intermediate node; instead, it compares the quality of the signal on the two incoming ports and selects the better signal.

CTC automates ring configuration. SNCP ring network traffic is defined within the ONS 15454 SDH on a circuit-by-circuit basis. If an extended SNCP ring mesh network circuit is not defined within a 1+1 or MS-SPRing line protection scheme and path protection is available and specified, CTC uses an SNCP ring as the default protection mechanism.

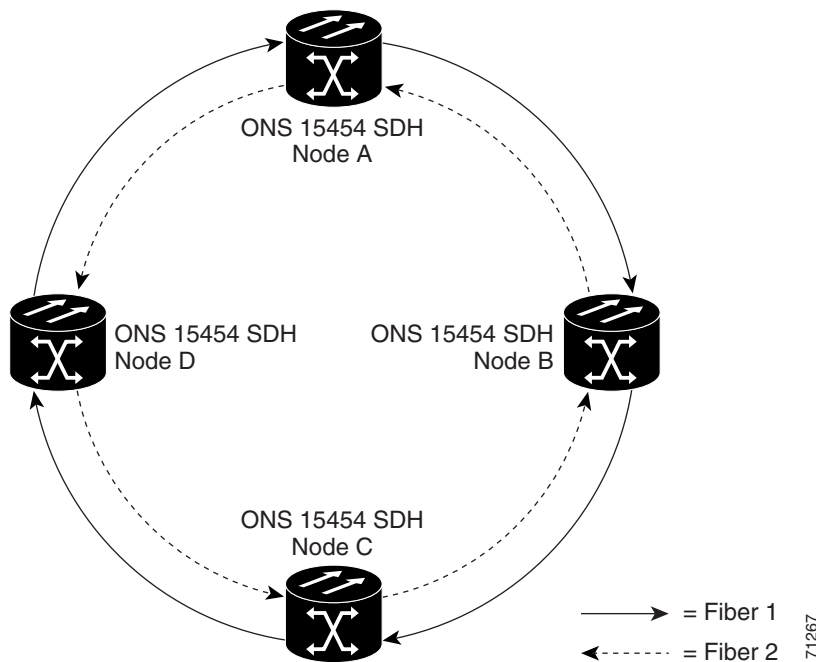
An SNCP ring circuit requires two DCC-provisioned optical spans per node. SNCP ring circuits can be created across these spans until their bandwidth is consumed.

The span bandwidth consumed by an SNCP ring circuit is two times the circuit bandwidth because the circuit is duplicated. The cross-connection bandwidth consumed by an SNCP ring circuit is three times the circuit bandwidth at the source and destination nodes only. The cross-connection bandwidth consumed by an intermediate node has a factor of one.

The SNCP ring circuit limit is the sum of the optical bandwidth containing 84 section data communication channels (SDCCs) or 28 line data communication channels (LDCCs), divided by two. The spans can be of any bandwidth from STM-1 to STM-64.

Figure 11-13 shows a basic SNCP ring configuration. If Node A sends a signal to Node C, the working signal travels on the working traffic path through Node B.

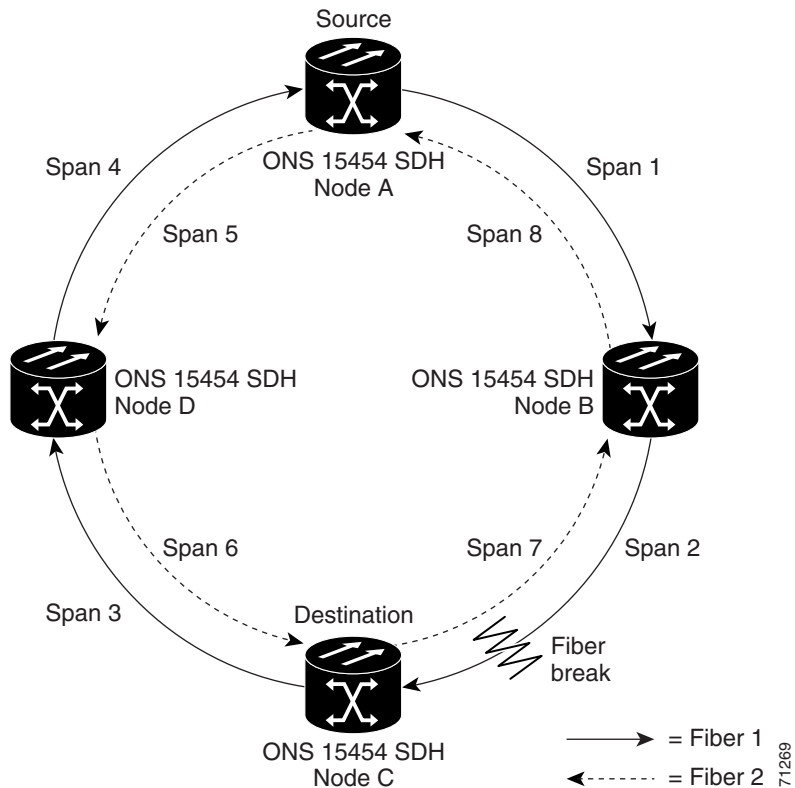
**Figure 11-13 Basic Four-Node SNCP Ring**





The same signal is also sent on the protect traffic path through Node D. If a fiber break occurs (Figure 11-14), Node C switches its active receiver to the protect signal coming through Node D.

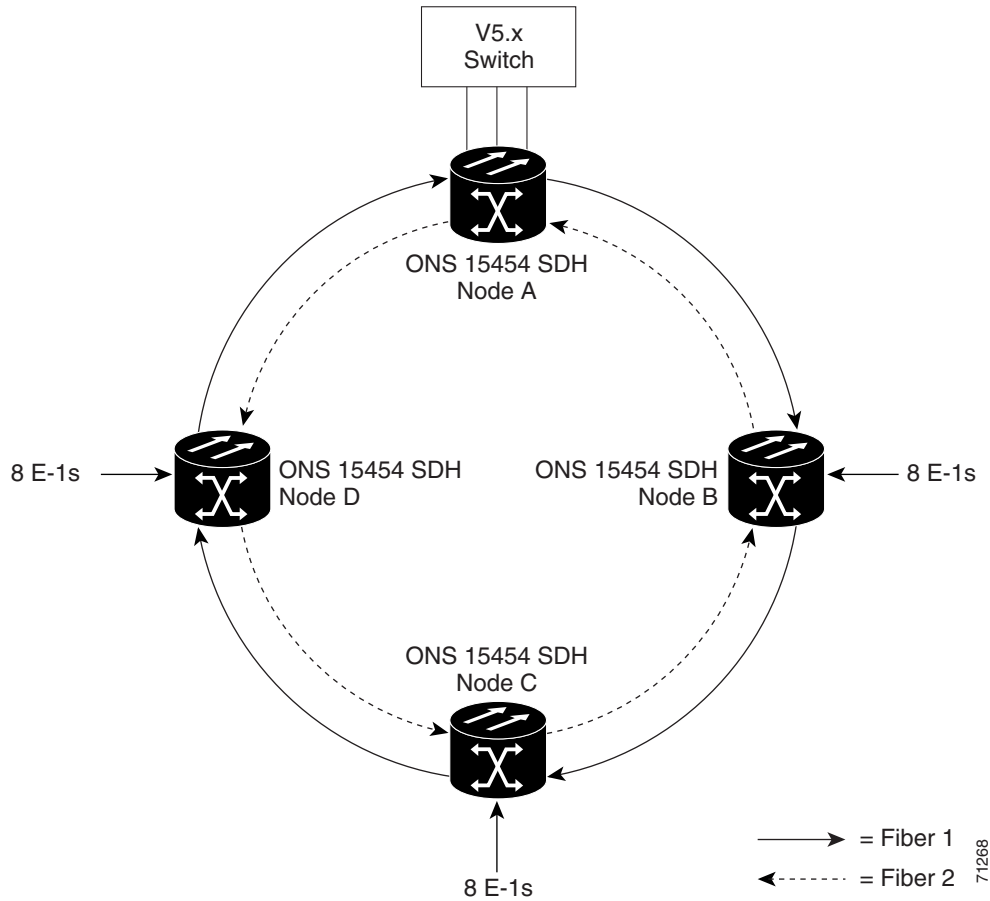
Figure 11-14 SNCP Ring with a Fiber Break



Because each traffic path is transported around the entire ring, SNCP rings are best suited for networks where traffic concentrates at one or two locations and is not widely distributed. SNCP ring capacity is equal to its bit rate. Services can originate and terminate on the same SNCP ring, or they can be passed to an adjacent access or interoffice ring for transport to the service-terminating node.

Figure 11-15 shows a common SNCP ring application. STM-1 path circuits provide remote switch connectivity to a host V5.x switch. In the example, each remote switch requires eight E-1s to return to the host switch. Figure 11-16 on page 11-17 and Figure 11-17 on page 11-17 show the shelf layout for each node in the example.

Figure 11-15 STM-1 SNCP Ring



Node A has four E1-14 cards to provide 42 active E-1 ports. The other sites only require two E1-14 cards to carry the eight E-1s to and from the remote switch. You can use the other half of each ONS 15454 SDH shelf assembly to provide support for a second or third ring to other existing or planned remote sites.

In this sample STM-1 SNCP ring, Node A contains four E1-14 cards and two STM-1 cards. Six free slots are available, which you can provision with cards or leave empty.

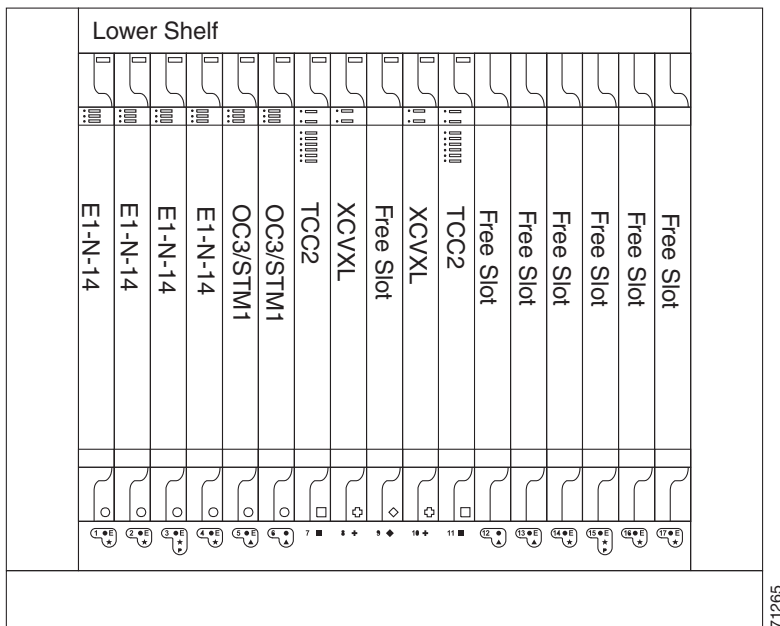


**Note**

Fill unused card slots with a blank faceplate (Cisco P/N 15454E-BLANK). The blank faceplate ensures proper airflow when operating the ONS 15454 SDH.

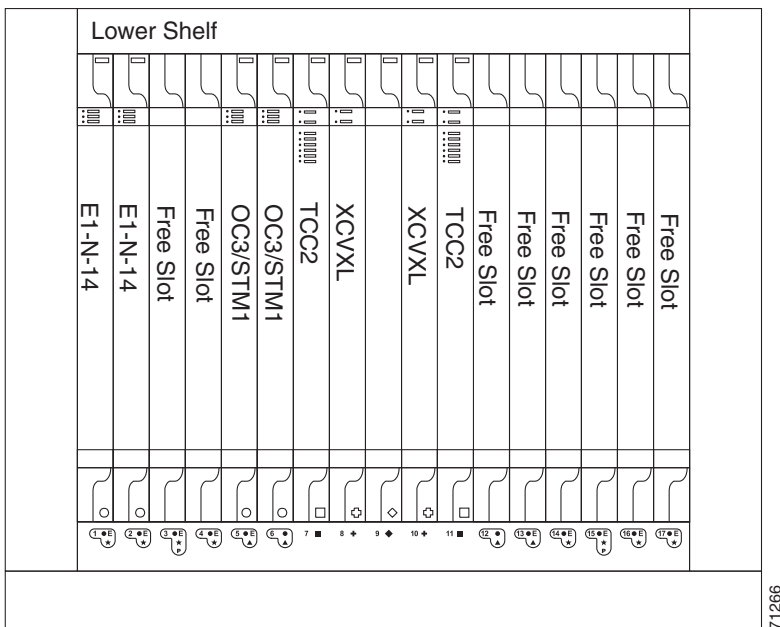
Figure 11-16 shows the shelf setup for this sample configuration.

**Figure 11-16 Card Setup of Node A in the STM-1 SNCP Ring Example**



In [Figure 11-15 on page 11-16](#), Nodes B through D each contain two E1-14 cards and two STM-1 cards. Eight free slots are available that you can provision with other cards or leave empty. [Figure 11-17](#) shows the shelf assembly setup for this sample configuration.

**Figure 11-17 Card Setup of Nodes B-D in the STM-1 SNCP Ring Example**



## 11.4 Dual Ring Interconnect

Dual ring interconnect (DRI) topology provides an extra level of path protection for circuits on interconnected rings. DRI allows users to interconnect MS-SPRings, SNCPs, or an SNCP with an MS-SPRing, with additional protection provided at the transition nodes. In a DRI topology, ring interconnections occur at two or four nodes.

The drop-and-continue DRI method is used for all ONS 15454 SDH DRIs. In drop-and-continue DRI, a primary node drops the traffic to the connected ring and routes traffic to a secondary node within the same ring. The secondary node also routes the traffic to the connected ring; that is, the traffic is dropped at two different interconnection nodes to eliminate single points of failure. To route circuits on DRI, you must choose the Dual Ring Interconnect option during circuit provisioning. Dual transmit is not supported.

Two DRI topologies can be implemented on the ONS 15454 SDH:

- A traditional DRI requires two pairs of nodes to interconnect two networks. Each pair of user-defined primary and secondary nodes drops traffic over a pair of interconnection links to the other network.
- An integrated DRI requires one pair of nodes to interconnect two networks. The two interconnected nodes replace the interconnection ring.

For DRI topologies, a hold-off timer sets the amount of time before a selector switch occurs. It reduces the likelihood of multiple switches, such as:

- Both a service selector and a path selector
- Both a line switch and a path switch of a service selector

For example, if a SNCP DRI service selector switch does not restore traffic, then the path selector switches after the hold-off time. The SNCP DRI hold-off timer default is 100 ms. You can change this setting in the SNCP Selectors tab of the Edit Circuits window. For MS-SPRing DRI, if line switching does not restore traffic, then the service selector switches. The hold-off time delays the recovery provided by the service selector. The MS-SPRing DRI default hold-off time is 100 ms and cannot be changed.

### 11.4.1 MS-SPRing DRI

Unlike MS-SPRing automatic protection switching (APS) protocol, MS-SPRing DRI is a path-level protection protocol at the circuit level. Drop-and-continue MS-SPRing DRI requires a service selector in the primary node for each circuit routing to the other ring. Service selectors monitor signal conditions from dual feed sources and select the one that has the best signal quality. Same-side routing drops the traffic at primary nodes set up on the same side of the connected rings, and opposite-side routing drops the traffic at primary nodes set up on the opposite sides of the connected rings. For MS-SPRing DRI, primary and secondary nodes cannot be the circuit source or destination.



#### Note

A DRI circuit cannot be created if an intermediate node exists on the interconnecting link. However, an intermediate node can be added on the interconnecting link after the DRI circuit is created.

DRI protection circuits act as protection channel access (PCA) circuits. In CTC, you set up DRI protection circuits by selecting the PCA option when setting up primary and secondary nodes during DRI circuit creation.

Figure 11-18 shows ONS 15454 SDHs in a traditional MS-SPRing DRI topology with same-side routing. In Ring 1, Nodes 3 and 4 are the interconnect nodes, and in Ring 2, Nodes 8 and 9 are the interconnect nodes. Duplicate signals are sent between Node 4 (Ring 1) and Node 9 (Ring 2), and between Node 3 (Ring 1) and Node 8 (Ring 2). The primary nodes (Nodes 4 and 9) are on the same side, and the secondary nodes (Nodes 3 and 8) provide an alternative route. In Ring 1, traffic at Node 4 is dropped (to Node 9) and continued (to Node 10). Similarly, at Node 9, traffic is dropped (to Node 4) and continued (to Node 5).

Figure 11-18 ONS 15454 SDH Traditional MS-SPRing Dual Ring Interconnect (Same-Side Routing)

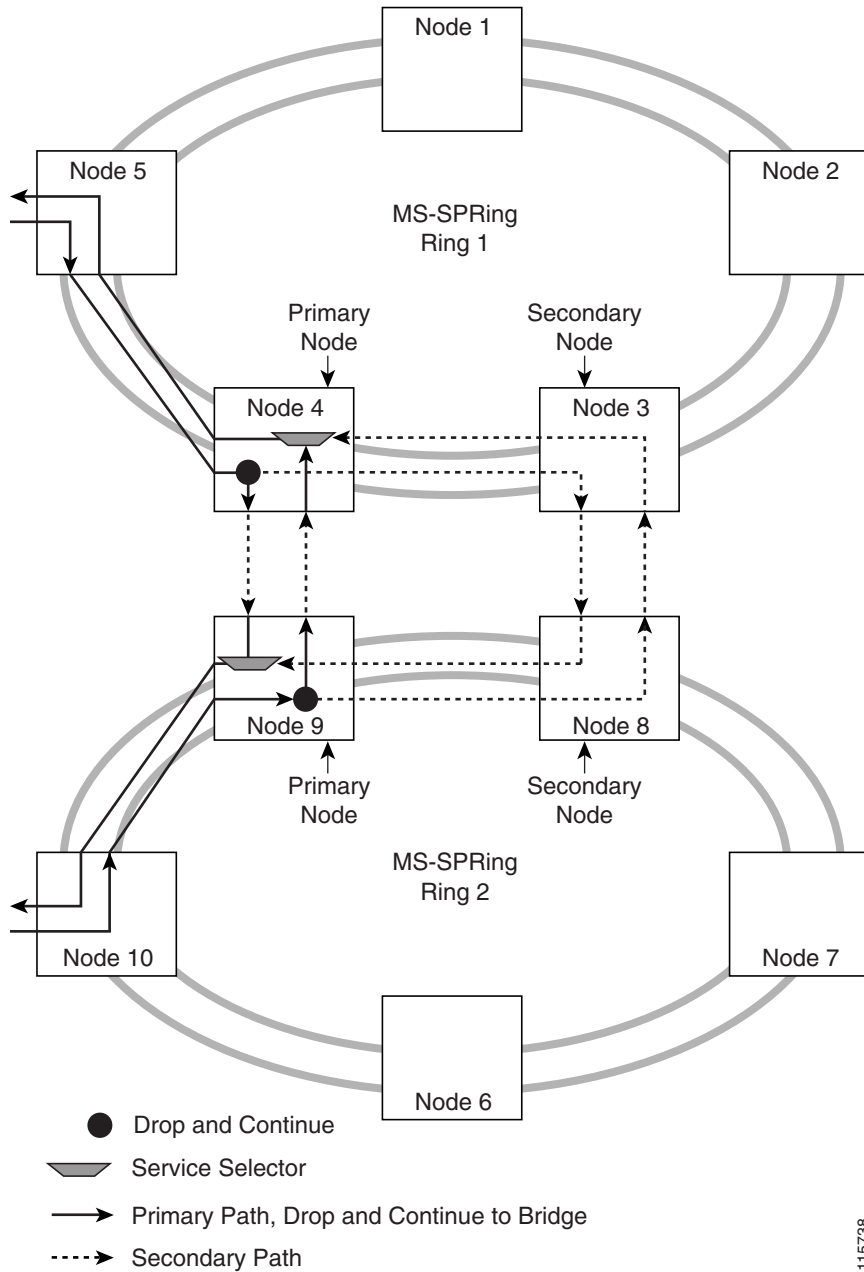


Figure 11-19 shows ONS 15454 SDHs in a traditional MS-SPRing DRI topology with opposite-side routing. In Ring 1, Nodes 3 and 4 are the interconnect nodes, and in Ring 2, Nodes 8 and 9 are the interconnect nodes. Duplicate signals are sent from Node 4 (Ring 1) to Node 8 (Ring 2), and between Node 3 (Ring 1) and Node 9 (Ring 2). In Ring 1, traffic at Node 4 is dropped (to Node 9) and continued (to Node 8). Similarly, at Node 8, traffic is dropped (to Node 3) and continued (to Node 4).

**Figure 11-19 ONS 15454 SDH Traditional MS-SPRing Dual Ring Interconnect (Opposite-Side Routing)**

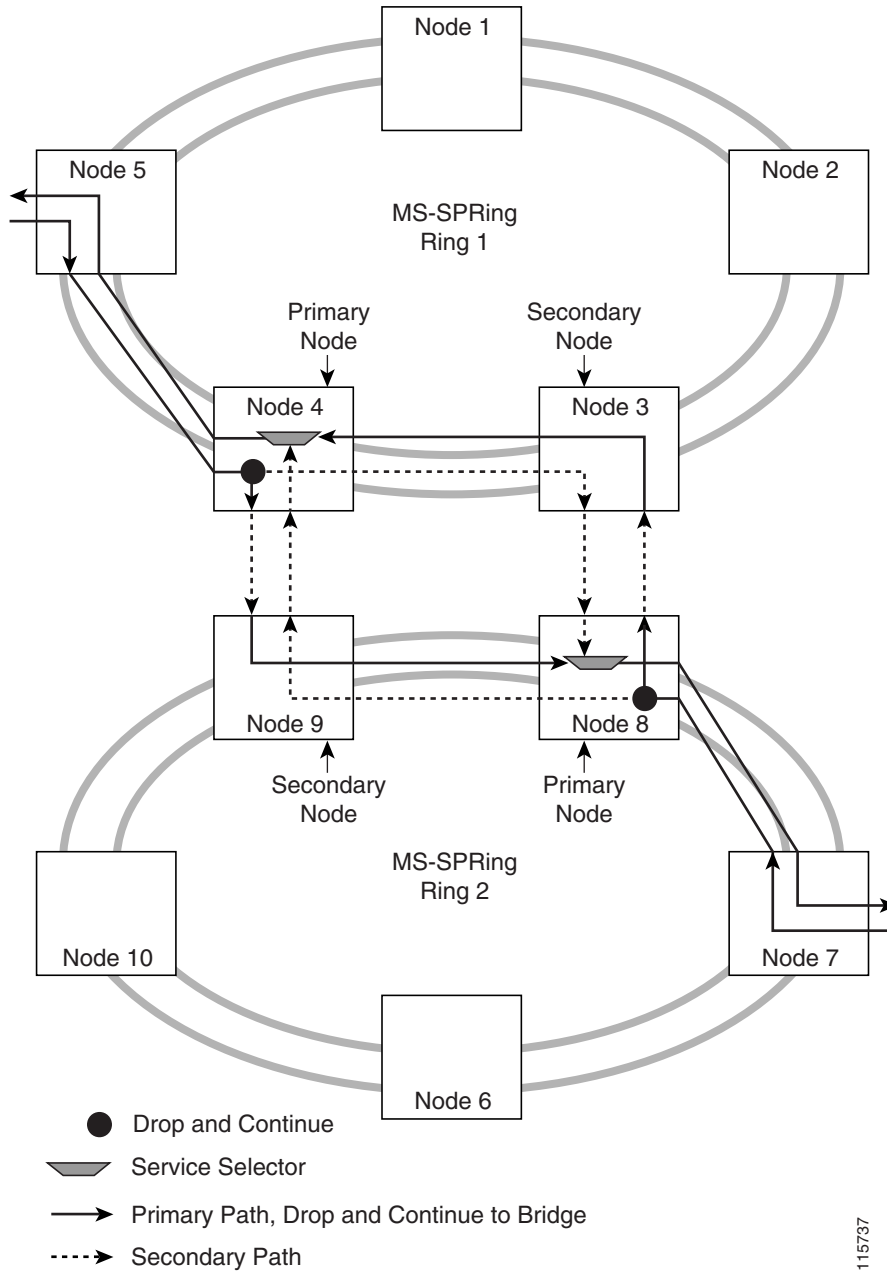
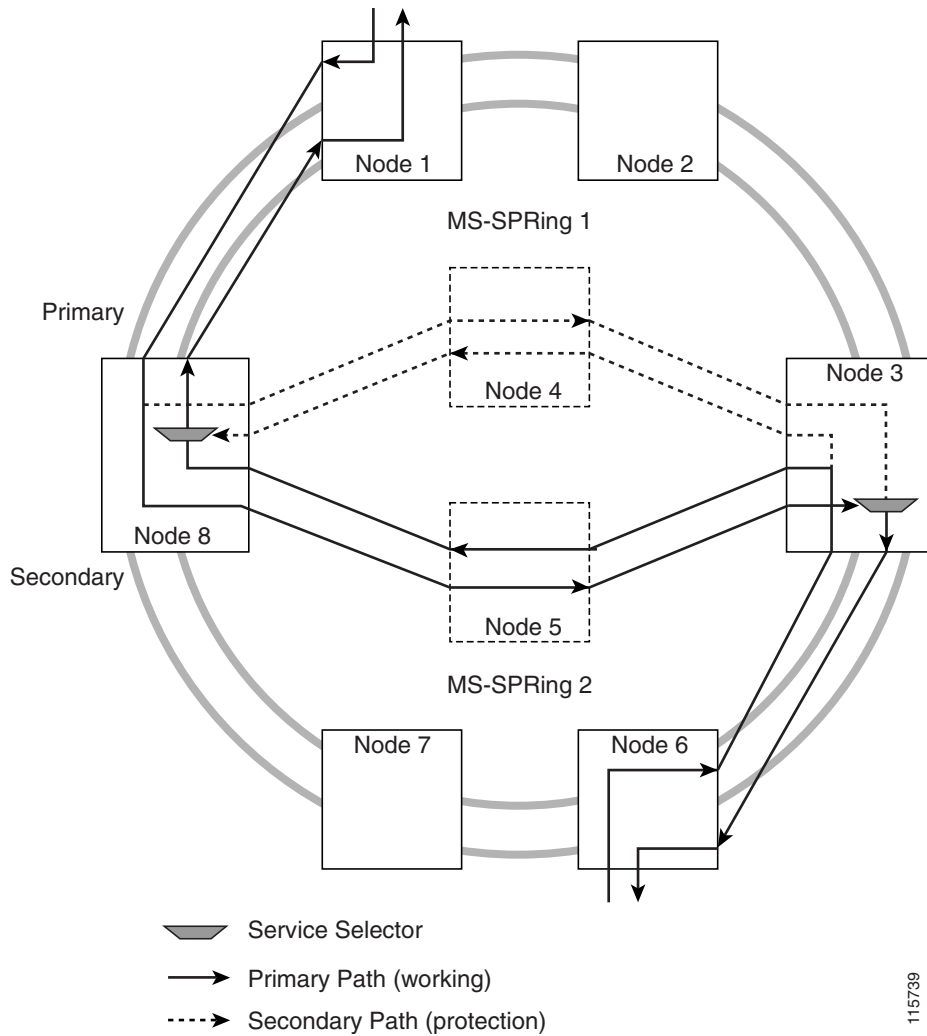


Figure 11-20 shows ONS 15454 SDHs in an integrated MS-SPRing DRI topology. The same drop-and-continue traffic routing occurs at two nodes, rather than four. This is achieved by installing an additional STM-N trunk at the two interconnect nodes. Nodes 3 and 8 are the interconnect nodes.

Figure 11-20 ONS 15454 SDH Integrated MS-SPRing Dual Ring Interconnect



## 11.4.2 SNCP Dual Ring Interconnect

The SNCP dual ring interconnect topology (SNCP DRI) provides an extra level of path protection between interconnected SNCP rings. In DRIs, traffic is dropped and continued at the interconnecting nodes to eliminate single points of failure. Two DRI topologies can be implemented on the ONS 15454 SDH. The traditional DRI uses four ONS 15454 SDHs at the interconnect nodes, while the integrated DRI uses two nodes.

[Figure 11-21](#) shows ONS 15454 SDHs in a traditional DRI topology. In Ring 1, Nodes 4 and 5 are the interconnect nodes, and in Ring 2, Nodes 6 and 7 are the interconnect nodes. Duplicate signals are sent from Node 4 (Ring 1) to Node 6 (Ring 2), and between Node 5 (Ring 1) and Node 7 (Ring 2). In Ring 1, traffic at Node 4 is dropped (to Node 6) and continued (to Node 5). Similarly, at Node 5, traffic is dropped (to Node 7) and continued (to Node 4).

To route circuits on the DRI, you must choose the DRI option during circuit provisioning. Circuits with the DRI option enabled are routed on the DRI path.



Figure 11-21 ONS 15454 Traditional SDH Dual Ring Interconnect

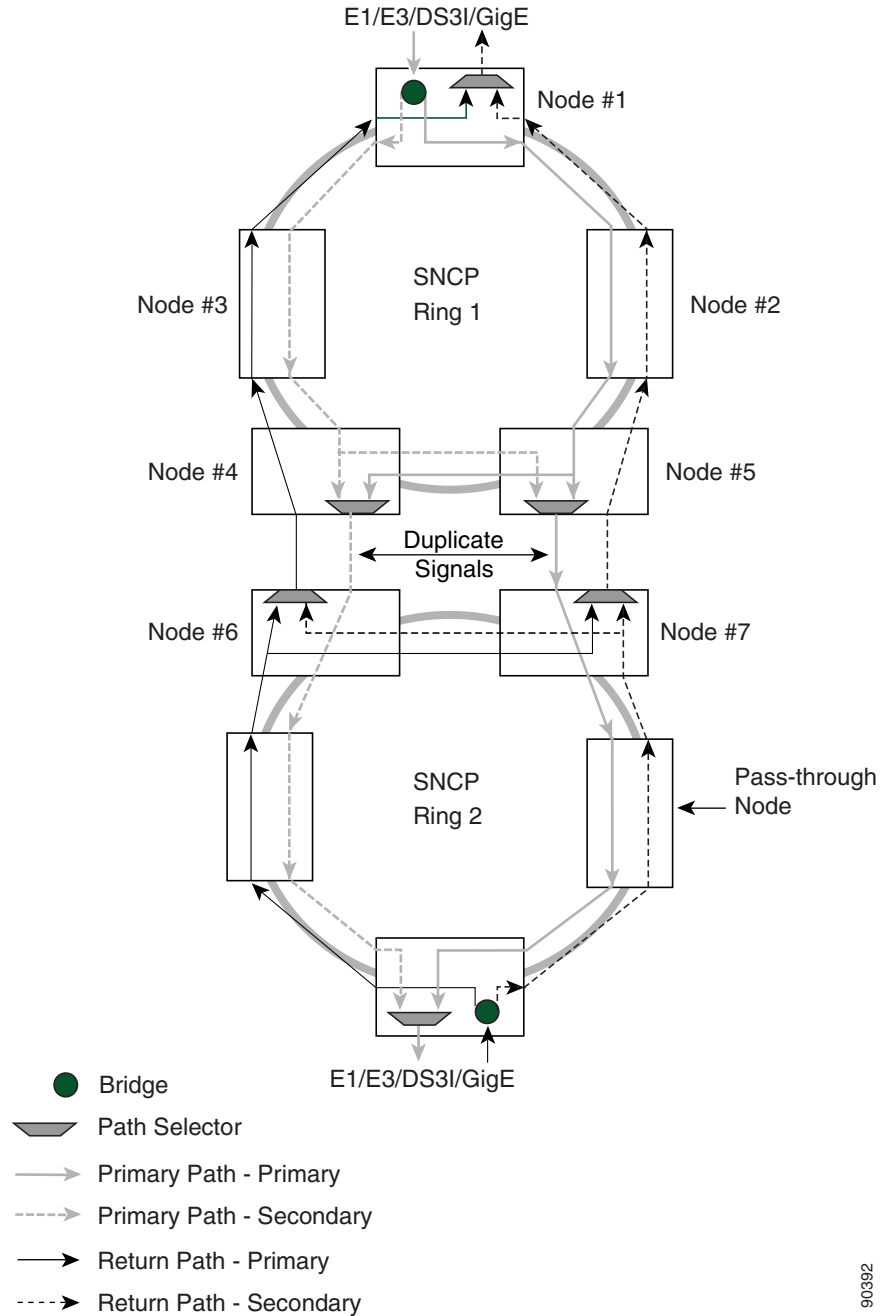
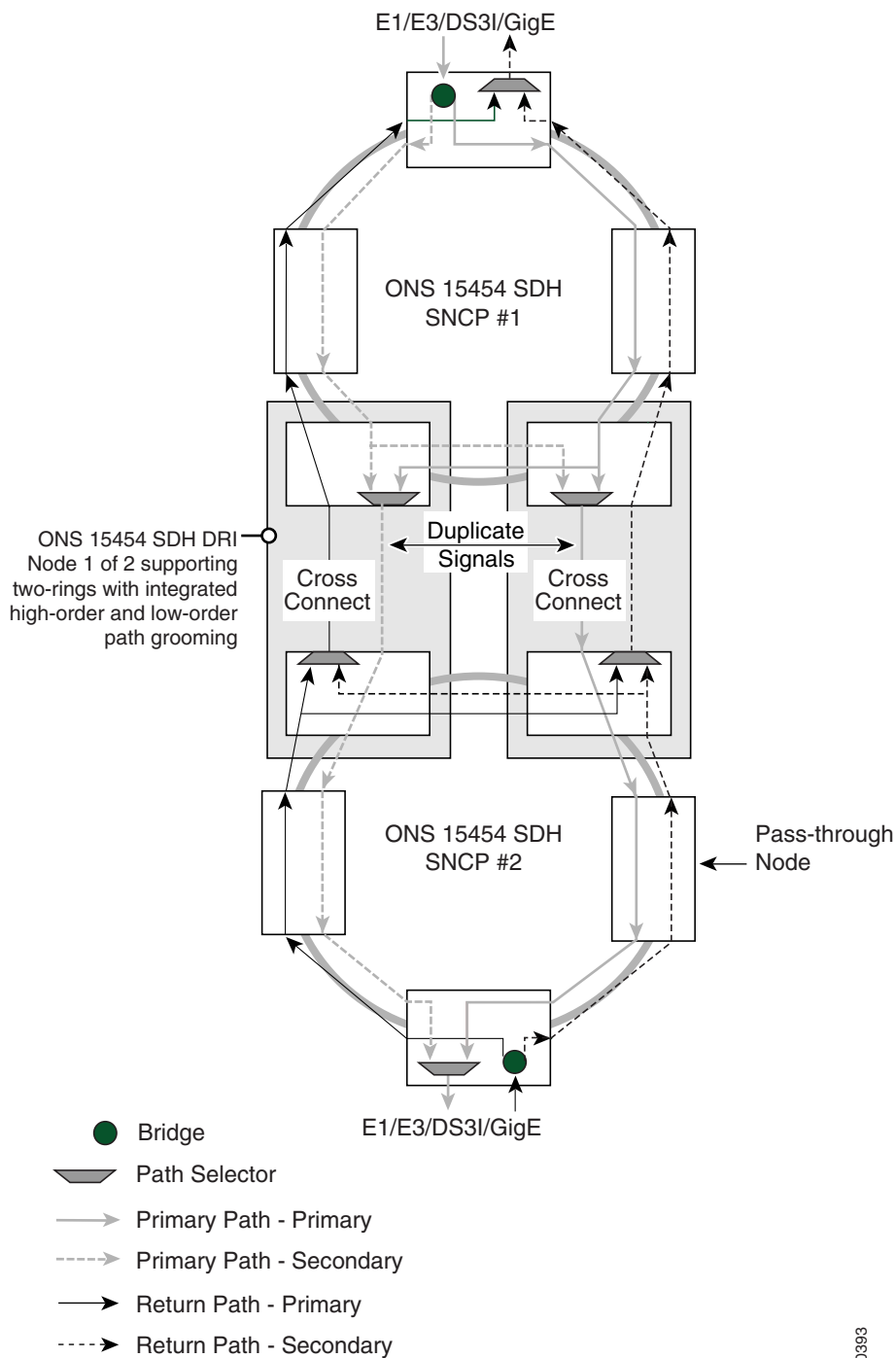


Figure 11-22 shows ONS 15454 SDHs in an integrated DRI topology. The same drop and continue traffic routing occurs at two nodes, rather than four. This is achieved by installing an additional STM-N trunk at the two interconnect nodes.

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Figure 11-22 ONS 15454 SDH Integrated Dual Ring Interconnect

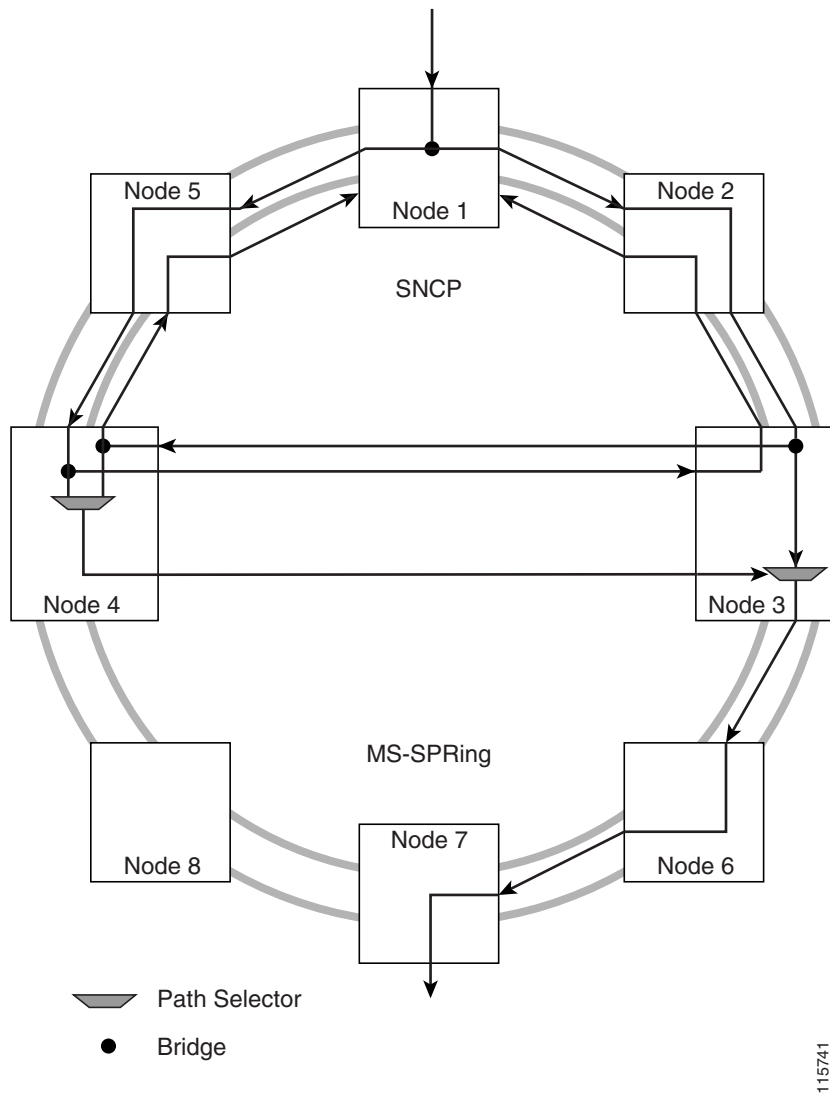


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Figure 11-24 shows an example of an SNCP to MS-SPRing integrated DRI handoff.

Figure 11-24 ONS 15454 SDH SNCP to MS-SPRing Integrated DRI Handoff



## 11.5 Subtending Rings

The ONS 15454 SDH supports up to 84 SDH regenerator SDCCs or 28 LDCCs with TCC2/TCC2P cards. See [Table 11-1 on page 11-1](#) for ring and regenerator SDCC and LDCC information.

Subtending rings reduce the number of nodes and cards required and reduce external shelf-to-shelf cabling. [Figure 11-25](#) shows an ONS 15454 SDH with multiple subtending rings.

Figure 11-25 ONS 15454 SDH with Multiple Subtending Rings

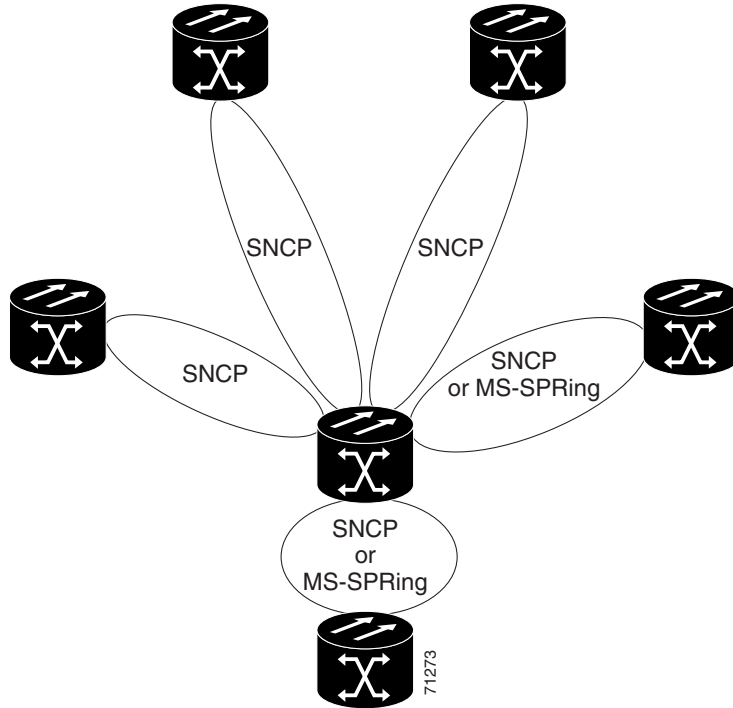
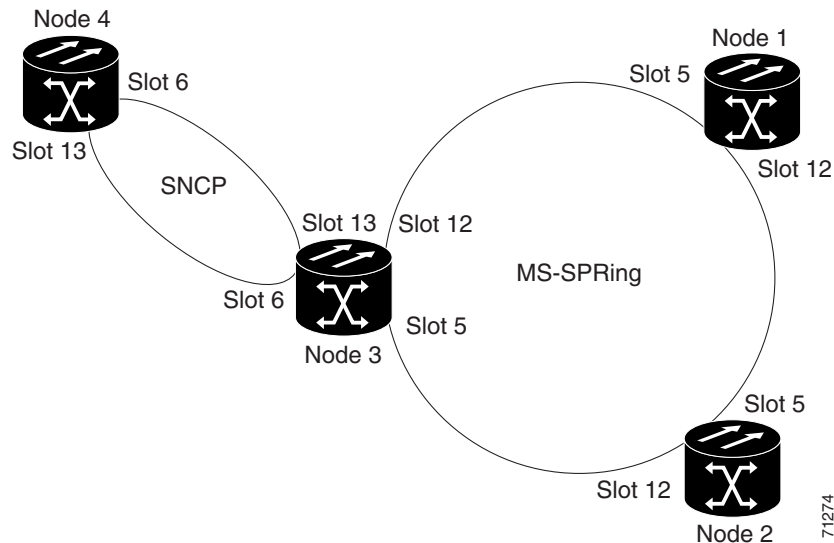


Figure 11-26 shows an SNCP ring subtending from an MS-SPRing. In this example, Node 3 is the only node serving both the MS-SPRing and SNCP ring. STM-N cards in Slots 5 and 12 serve the MS-SPRing, and STM-N cards in Slots 6 and 13 serve the SNCP ring.

Figure 11-26 SNCP Ring Subtending from an MS-SPRing



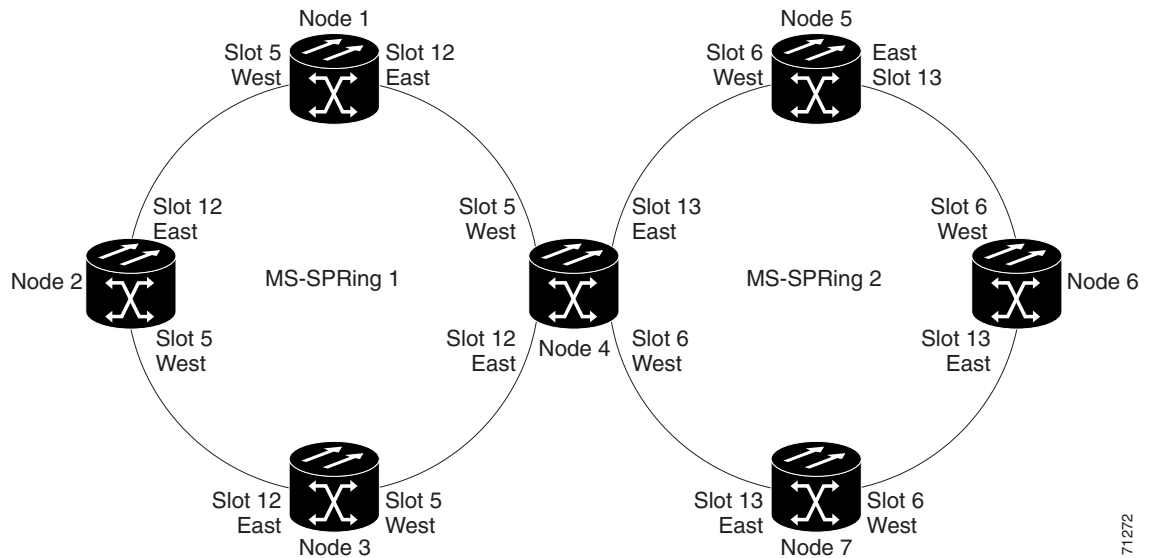
The ONS 15454 SDH can support five MS-SPRings on the same node. This allows you to deploy an ONS 15454 SDH in applications requiring SDH Digital Cross-connect Systems (DCSs) or multiple SDH add/drop multiplexers (ADM)s.

Figure 11-27 shows two MS-SPRings shared by one ONS 15454 SDH. Ring 1 runs on Nodes 1, 2, 3, and 4. Ring 2 runs on Nodes 4, 5, 6, and 7. Two MS-SPRings, Ring 1 and Ring 2, are provisioned on Node 4. Ring 1 uses cards in Slots 5 and 12, and Ring 2 uses cards in Slots 6 and 13.

**Note**

Nodes in different MS-SPRings can have the same or different node IDs.

**Figure 11-27 MS-SPRing Subtending from an MS-SPRing**



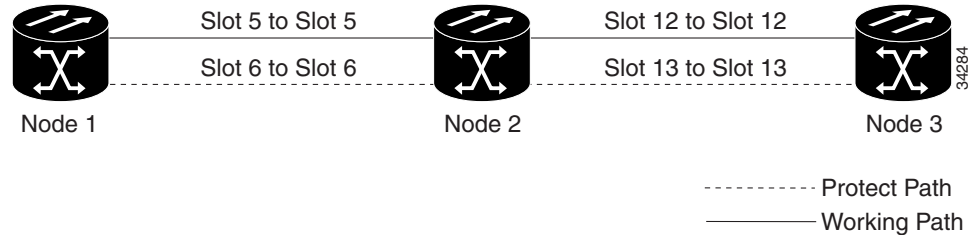
After subtending two MS-SPRings, you can route circuits from nodes in one ring to nodes in the second ring. For example, in Figure 11-27 you can route a circuit from Node 1 to Node 7. The circuit would normally travel from Node 1 to Node 4 to Node 7. If fiber breaks occur, for example between Nodes 1 and 4 and Nodes 4 and 7, traffic is rerouted around each ring: in this example, Nodes 2 and 3 in Ring 1 and Nodes 5 and 6 in Ring 2.

## 11.6 Linear ADM Configurations

You can configure ONS 15454 SDHs as a line of add/drop multiplexers (ADMs) by configuring one set of STM-N cards as the working path and a second set as the protect path. Unlike rings, linear (point-to-point) ADMs require that the STM-N cards at each node be in 1+1 protection to ensure that a break to the working line is automatically routed to the protect line.

Figure 11-28 shows three ONS 15454 SDH nodes in a linear ADM configuration. Working traffic flows from Node 1/Slot 5 to Node 2/Slot 5, and from Node 2/Slot 12 to Node 3/Slot 12. You create the protect path by placing Slot 6 in 1+1 protection with Slot 5 at Nodes 1 and 2, and placing Slot 12 in 1+1 protection with Slot 13 at Nodes 2 and 3.

**Figure 11-28** Linear (Point-to-Point) ADM Configuration



## 11.7 Extended SNCP Mesh Networks

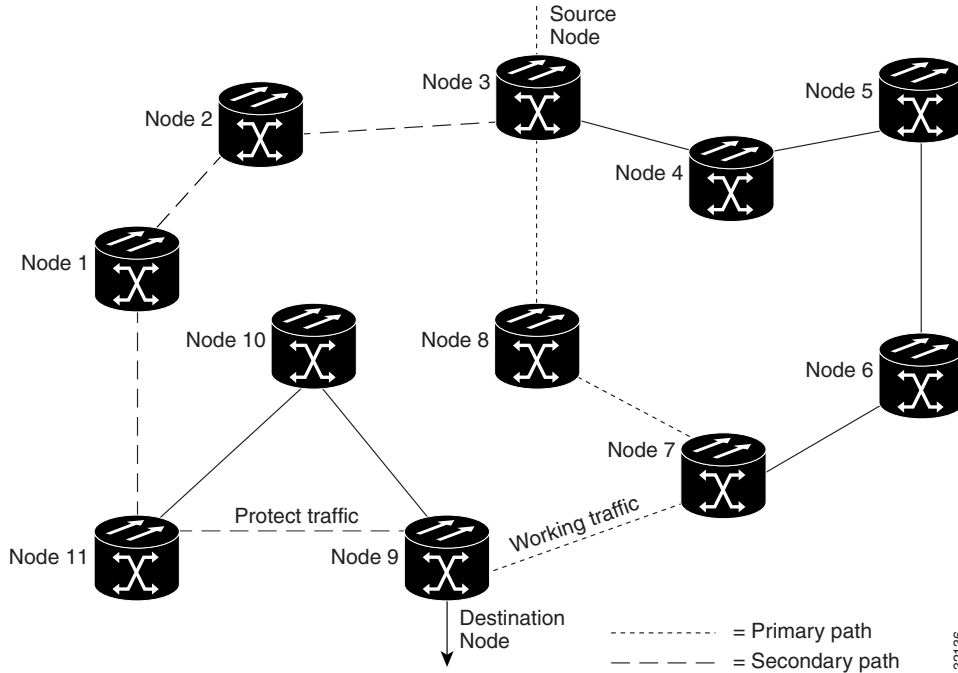
In addition to single MS-SPRings, SNCP rings, and ADMs, you can extend ONS 15454 SDH traffic protection by creating extended SNCP mesh networks. Extended SNCP rings include multiple ONS 15454 SDH topologies and extend the protection provided by a single SNCP ring to the meshed architecture of several interconnecting rings.

In an extended SNCP ring, circuits travel diverse paths through a network of single or multiple meshed rings. When you create circuits, you can provision CTC to automatically route circuits across the Extended SNCP ring, or you can manually route them. You can also choose levels of circuit protection. For example, if you choose full protection, CTC creates an alternate route for the circuit in addition to the main route. The second route follows a unique path through the network between the source and destination and sets up a second set of cross-connections.

For example, in [Figure 11-29](#), a circuit is created from Node 3 to Node 9. CTC determines that the shortest route between the two nodes passes through Node 8 and Node 7, shown by the dotted line, and automatically creates cross-connections at Nodes, 3, 8, 7, and 9 to provide the primary circuit path.

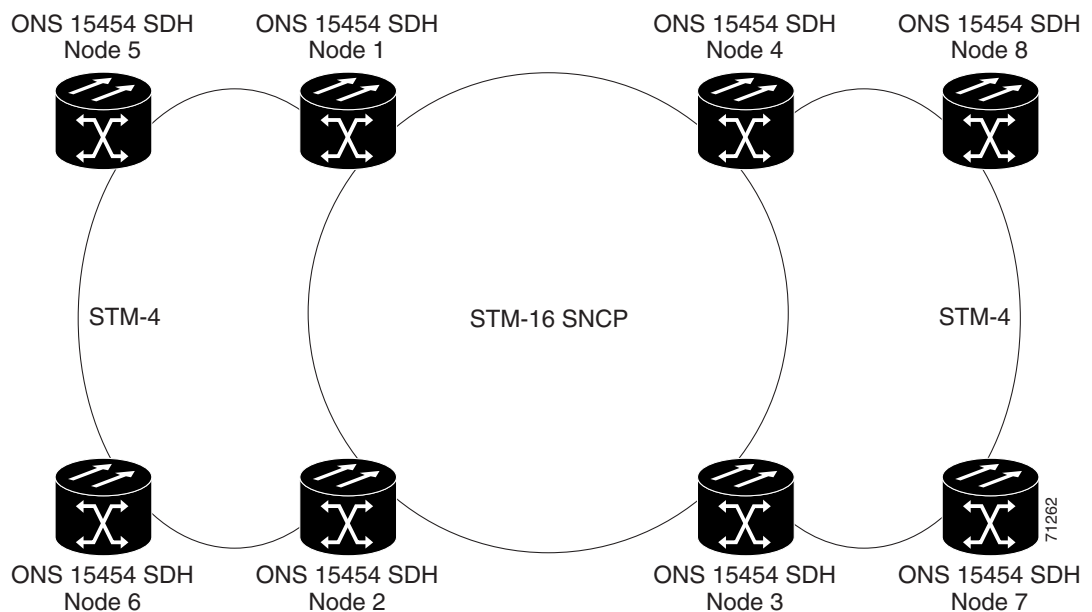
If full protection is selected, CTC creates a second unique route between Nodes 3 and 9 which, in this example, passes through Nodes 2, 1, and 11. Cross-connections are automatically created at Nodes 3, 2, 1, 11, and 9, shown by the dashed line. If a failure occurs on the primary path, traffic switches to the second circuit path. In this example, Node 9 switches from the traffic coming in from Node 7 to the traffic coming in from Node 11 and service resumes. The switch occurs within 50 ms.

Figure 11-29 Extended SNCP Mesh Network



Extended SNCP rings also allow spans with different SDH speeds to be mixed together in “virtual rings.” Figure 11-30 shows Nodes 1, 2, 3, and 4 in a standard STM-16 ring. Nodes 5, 6, 7, and 8 link to the backbone ring through STM-4 fiber. The “virtual ring” formed by Nodes 5, 6, 7, and 8 uses both STM-16 and STM-4 cards.

Figure 11-30 Extended SNCP Virtual Ring





## 11.8 Four Node Configurations

You can link multiple ONS 15454 SDHs using their STM-N cards (that is, create a fiber-optic bus) to accommodate more access traffic than a single ONS 15454 SDH can support. Refer to the *Cisco ONS 15454 SDH Procedure Guide* for more information. You can link nodes with STM-4 or STM-16 fiber spans as you would link any other two network nodes. The nodes can be grouped in one facility to aggregate more local traffic. Each shelf assembly is recognized as a separate node in the ONS 15454 SDH software interface and traffic is mapped using CTC cross-connect options.

## 11.9 STM-N Speed Upgrades

A span is the optical fiber connection between two ONS 15454 SDH nodes. In a span (optical speed) upgrade, the transmission rate of a span is upgraded from a lower to a higher STM-N signal but all other span configuration attributes remain unchanged. With multiple nodes, a span upgrade is a coordinated series of upgrades on all nodes in the ring or protection group. You can perform in-service span upgrades for the following ONS 15454 SDH cards:

- Single-port STM-4 to STM-16
- Single-port STM-4 to STM-64
- STM-16 to STM-64

You can also perform in-service card upgrades for the following ONS15454 cards:

- Four-port STM-1 to eight-port STM-1
- Single-port STM-4 to four-port STM-4

**Note**

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Since the four-port STM-1 to eight-port STM-1 cards and the single-port STM-4 to four-port STM-4 cards are the same speed, they are not considered span upgrades.

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To perform a span upgrade, the higher-rate optical card must replace the lower-rate card in the same slot. If the upgrade is conducted on spans residing in an MS-SPRing, all spans in the ring must be upgraded. The protection configuration of the original lower-rate optical card (two-fiber MS-SPRing, four-fiber MS-SPRing, SNCP ring, and 1+1) is retained for the higher-rate STM-N card.

When performing span upgrades on a large number of nodes, we recommend that you upgrade all spans in a ring consecutively and in the same maintenance window. Until all spans are upgraded, mismatched card types are present.

We recommend using the Span Upgrade Wizard to perform span upgrades. Although you can also use the manual span upgrade procedures, the manual procedures are mainly provided as error recovery for the wizard. The Span Upgrade Wizard and the Manual Span Upgrade procedures require at least two technicians (one at each end of the span) who can communicate with each other during the upgrade. Upgrading a span is non-service affecting and causes no more than three switches, each of which is less than 50 ms in duration.

**Note**

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Span upgrades do not upgrade SDH topologies, for example, a 1+1 group to a two-fiber MS-SPRing. Refer to the *Cisco ONS 15454 SDH Procedure Guide* for topology upgrade procedures.

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## 11.9.1 Span Upgrade Wizard

The Span Upgrade Wizard automates all steps in the manual span upgrade procedure (MS-SPRing, SNCP ring, and 1+1). The wizard can upgrade both lines on one side of a four-fiber MS-SPRing or both lines of a 1+1 group; the wizard upgrades SNCP rings and two-fiber MS-SPRings one line at a time. The Span Upgrade Wizard requires that spans have DCCs enabled.

The Span Upgrade Wizard provides no way to back out of an upgrade. In the case of an error, you must exit the wizard and initiate the manual procedure to either continue with the upgrade or back out of it. To continue with the manual procedure, examine the standing conditions and alarms to identify the stage in which the wizard failure occurred.

## 11.9.2 Manual Span Upgrades

Manual Span Upgrades are mainly provided as error recovery for the Span Upgrade Wizard, but they can be used to perform span upgrades. Downgrading can be performed to back out of a span upgrade. The procedure for downgrading is the same as upgrading except that you choose a lower-rate card type. You cannot downgrade if circuits exist on the VCs that will be removed (the higher VCs).

Procedures for manual span upgrades can be found in the “Upgrade Cards and Spans” chapter in the *Cisco ONS 15454 SDH Procedure Guide*. Five manual span upgrade options are available:

- Upgrade on a two-fiber MS-SPRing
- Upgrade on a four-fiber MS-SPRing
- Upgrade on an SNCP ring
- Upgrade on a 1+1 protection group
- Upgrade on an unprotected span



## CTC Network Connectivity

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This chapter provides nine scenarios showing Cisco ONS 15454 SDH nodes in common IP network configurations as well as information about provisionable patchcords, the routing table, external firewalls, and open gateway network element (GNE) networks. The chapter does not provide a comprehensive explanation of IP networking concepts and procedures. For IP set up instructions, refer to the “Turn Up Node” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [12.1 IP Networking Overview, page 12-1](#)
- [12.2 IP Addressing Scenarios, page 12-2](#)
- [12.3 Provisionable Patchcords, page 12-21](#)
- [12.4 Routing Table, page 12-23](#)
- [12.5 External Firewalls, page 12-25](#)
- [12.6 Open GNE, page 12-27](#)



**Note**

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To connect ONS 15454 SDH nodes to an IP network, you must work with a LAN administrator or other individual at your site who has IP networking training and experience.

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### 12.1 IP Networking Overview

ONS 15454 SDH nodes can be connected in many different ways within an IP environment:

- They can be connected to LANs through direct connections or a router.
- IP subnetting can create ONS 15454 SDH login node groups that allow you to provision non-data communications channel (DCC) connected nodes in a network.
- Different IP functions and protocols can be used to achieve specific network goals. For example, Proxy Address Resolution Protocol (ARP) enables one LAN-connected ONS 15454 SDH to serve as a gateway for ONS 15454 SDH nodes that are not connected to the LAN.
- Static routes can be created to enable connections among multiple Cisco Transport Controller (CTC) sessions with ONS 15454 SDH nodes that reside on the same subnet with multiple CTC sessions.
- ONS 15454 SDH nodes can be connected to Open Shortest Path First (OSPF) networks so ONS 15454 SDH network information is automatically communicated across multiple LANs and WANs.

- The ONS 15454 SDH proxy server can control the visibility and accessibility between CTC computers and ONS 15454 SDH element nodes.

## 12.2 IP Addressing Scenarios

ONS 15454 SDH IP addressing generally has eight common scenarios or configurations. Use the scenarios as building blocks for more complex network configurations. [Table 12-1](#) provides a general list of items to check when setting up ONS 15454 SDH nodes in IP networks.

**Table 12-1** General ONS 15454 SDH IP Troubleshooting Checklist

Item	What to check
Link integrity	Verify that link integrity exists between: <ul style="list-style-type: none"> <li>• CTC computer and network hub/switch</li> <li>• ONS 15454 SDH nodes (MIC-C/T/P wire-wrap pins or RJ-45 port) and network hub/switch</li> <li>• Router ports and hub/switch ports</li> </ul>
ONS 15454 SDH hub/switch ports	If connectivity problems occur, set the hub or switch port that is connected to the ONS 15454 SDH to 10 Mbps half-duplex.
Ping	Ping the node to test connections between computers and ONS 15454 SDH nodes.
IP addresses/subnet masks	Verify that ONS 15454 SDH IP addresses and subnet masks are set up correctly.
Optical connectivity	Verify that ONS 15454 SDH optical trunk (span) ports are in service and that a DCC is enabled on each trunk port.



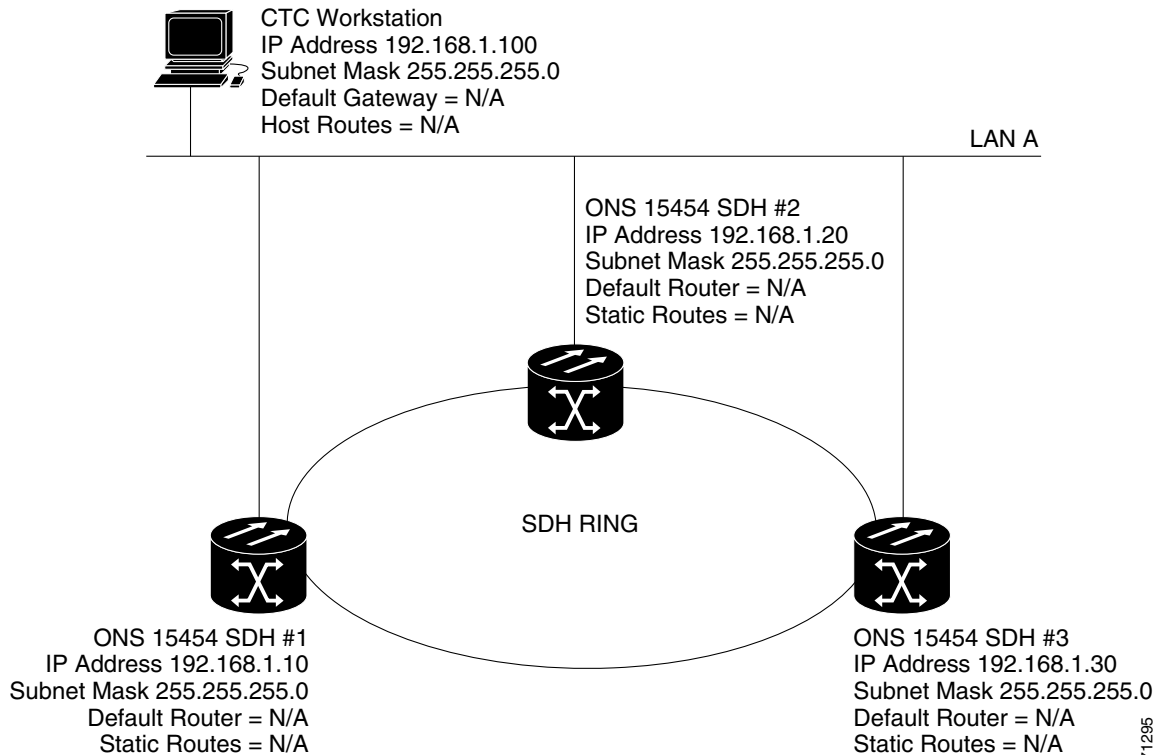
### Note

The ONS 15454 secure mode option is available when TCC2/TCC2P cards are installed. Secure mode allows two IP addresses to be provisioned for the node, one for the MIC-C/T/P LAN port and one for the TCC2/TCC2P TCP/IP port. Secure mode IP addressing is described in the [“12.2.9 Scenario 9: IP Addressing with Secure Mode Enabled”](#) section on page 12-19. IP addresses shown in the other scenarios assume secure mode is not enabled or, if enabled, the IP addresses shown in the examples apply to the MIC-C/T/P LAN port.

### 12.2.1 Scenario 1: CTC and ONS 15454 SDH Nodes on Same Subnet

Scenario 1 shows a basic ONS 15454 SDH LAN configuration ([Figure 12-1](#)). The ONS 15454 SDH nodes and CTC computer reside on the same subnet. All ONS 15454 SDH nodes connect to LAN A and all ONS 15454 SDH nodes have DCC connections.

Figure 12-1 Scenario 1: CTC and ONS 15454 SDH Nodes on the Same Subnet

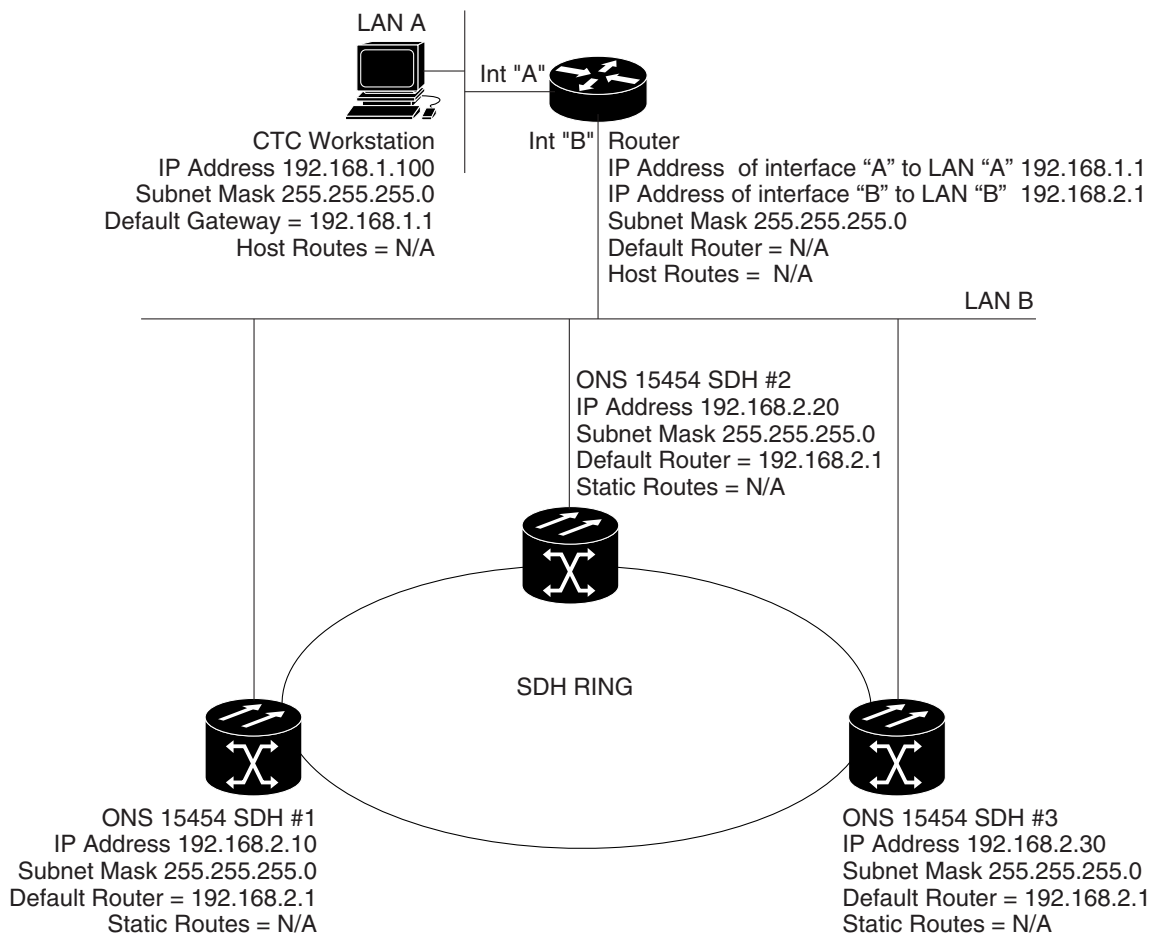


## 12.2.2 Scenario 2: CTC and ONS 15454 SDH Nodes Connected to a Router

In Scenario 2 the CTC computer resides on a subnet (192.168.1.0) and attaches to LAN A (Figure 12-2). The ONS 15454 SDH nodes reside on a different subnet (192.168.2.0) and attach to LAN B. A router connects LAN A to LAN B. The IP address of router interface A is set to LAN A (192.168.1.1), and the IP address of router interface B is set to LAN B (192.168.2.1).

On the CTC computer, the default gateway is set to router interface A. If the LAN uses Dynamic Host Configuration Protocol (DHCP), the default gateway and IP address are assigned automatically. In the example shown in Figure 12-2, a DHCP server is not available.

Figure 12-2 Scenario 2: CTC and ONS 15454 SDH Nodes Connected to Router



### 12.2.3 Scenario 3: Using Proxy ARP to Enable an ONS 15454 SDH Gateway

ARP matches higher-level IP addresses to the physical addresses of the destination host. It uses a lookup table (called an ARP cache) to perform the translation. When the address is not found in the ARP cache, a broadcast is sent out on the network with a special format called the ARP request. If one of the machines on the network recognizes its own IP address in the request, it sends an ARP reply back to the requesting host. The reply contains the physical hardware address of the receiving host. The requesting host stores this address in its ARP cache so that all subsequent datagrams (packets) to this destination IP address can be translated to a physical address.

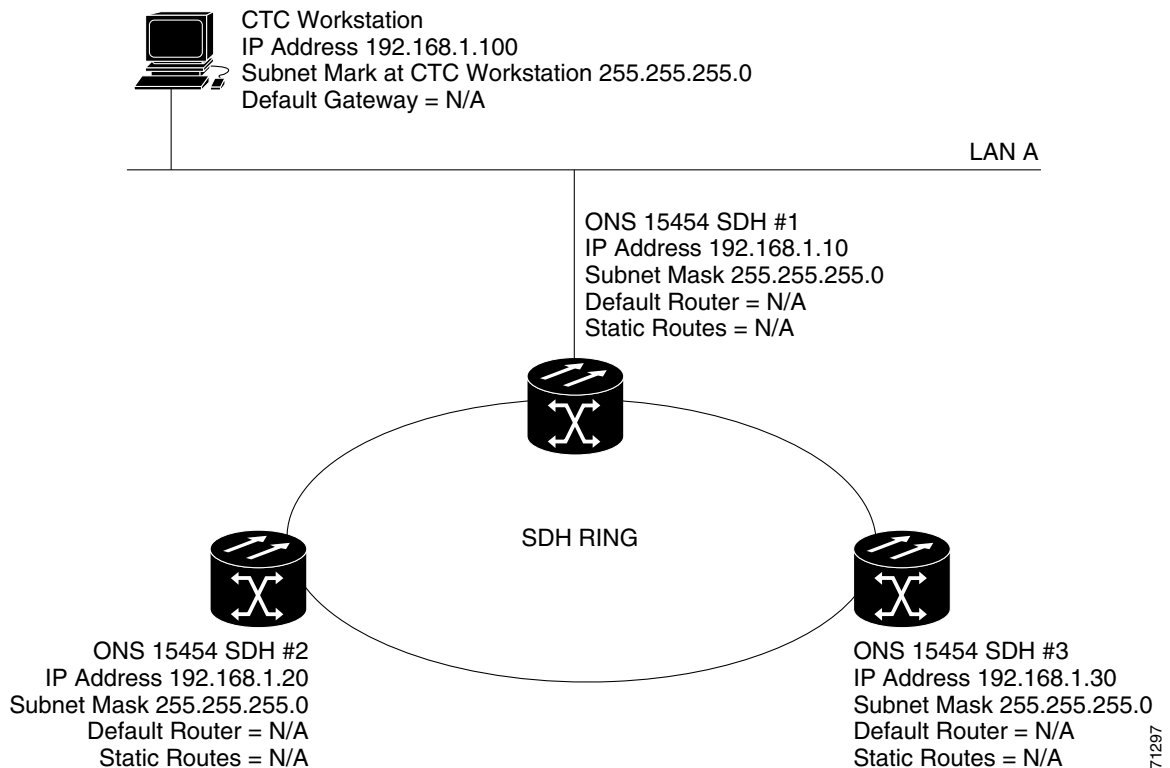
Proxy ARP enables one LAN-connected ONS 15454 SDH to respond to the ARP request for ONS 15454 SDH nodes that are not connected to the LAN. (ONS 15454 SDH proxy ARP requires no user configuration.) The DCC-connected ONS 15454 SDH nodes must reside on the same subnet. When a LAN device sends an ARP request to an ONS 15454 SDH that is not connected to the LAN, the gateway ONS 15454 SDH returns its MAC address to the LAN device. The LAN device then sends the datagram for the remote ONS 15454 SDH to the MAC address of the proxy ONS 15454 SDH. The proxy ONS 15454 SDH uses its routing table to forward the datagram to the non-LAN ONS 15454 SDH.

Scenario 3 is similar to Scenario 1, but only one ONS 15454 SDH (#1) connects to the LAN (Figure 12-3). Two ONS 15454 SDH nodes (#2 and #3) connect to ONS 15454 SDH #1 through the SDH DCC. Because all three nodes are on the same subnet, proxy ARP enables ONS 15454 SDH #1 to serve as a gateway for ONS 15454 SDH #2 and #3.

**Note**

This scenario assumes all CTC connections are to ONS 15454 SDH #1. If you connect a laptop to ONS 15454 SDH #2 or #3, network partitioning occurs; neither the laptop or the CTC computer can see all nodes. If you want laptops to connect directly to end network elements, you need to create static routes (see Scenario 5) or enable the ONS 15454 SDH proxy server (see Scenario 7).

**Figure 12-3 Scenario 3: Using Proxy ARP**

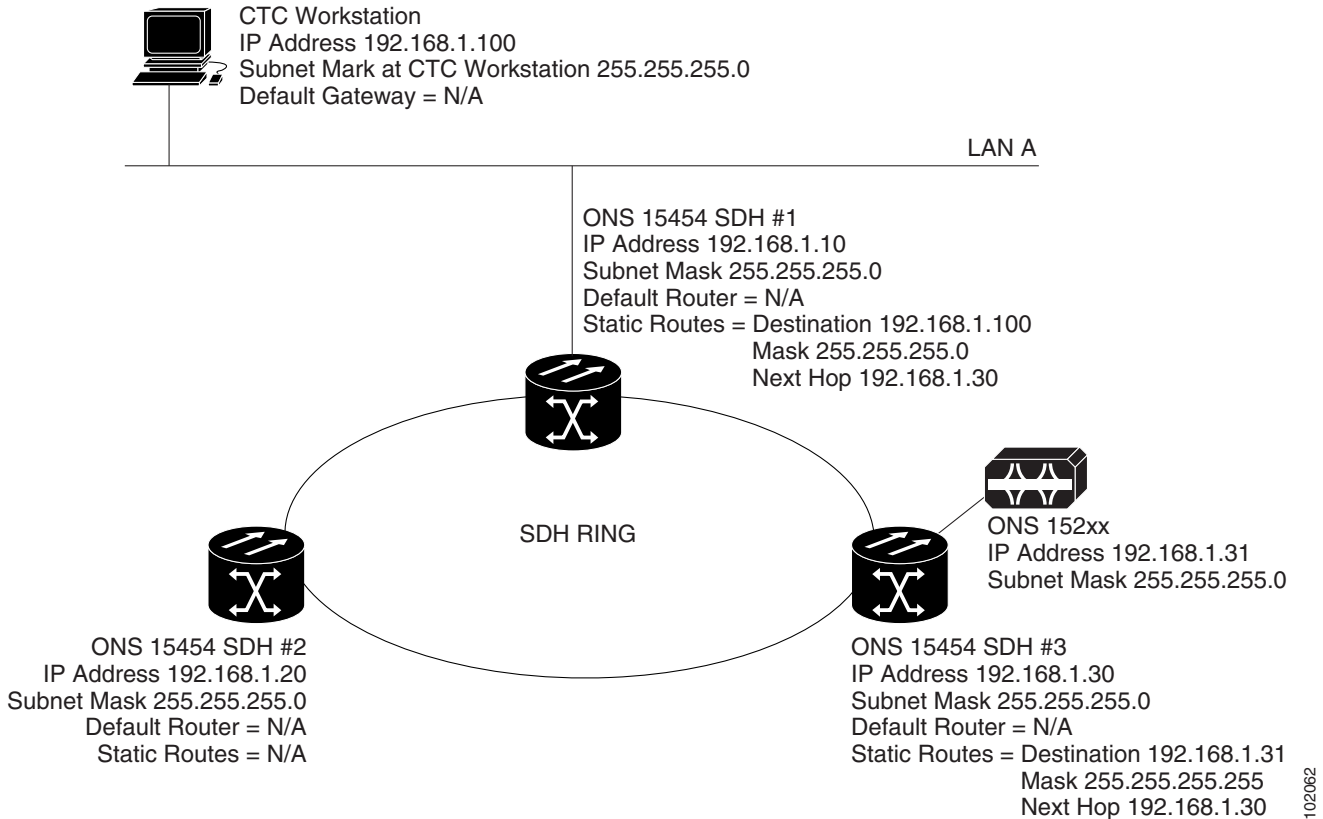


You can also use proxy ARP to communicate with hosts attached to the craft Ethernet ports of DCC-connected nodes (Figure 12-4). The node with an attached host must have a static route to the host. Static routes are propagated to all DCC peers using OSPF. The existing proxy ARP node is the gateway for additional hosts. Each node examines its routing table for routes to hosts that are not connected to the DCC network but are within the subnet. The existing proxy server replies to ARP requests for these additional hosts with the node MAC address. The existence of the host route in the routing table ensures that the IP packets addressed to the additional hosts are routed properly. Other than establishing a static route between a node and an additional host, no provisioning is necessary. The following restrictions apply:

- Only one node acts as the proxy ARP server for any given additional host.
- A node cannot be the proxy ARP server for a host connected to its Ethernet port.

In Figure 12-4, ONS 15454 SDH #1 announces to ONS 15454 SDH #2 and #3 that it can reach the CTC host. Similarly, ONS 15454 SDH #3 announces that it can reach the ONS 152xx. The ONS 152xx is shown as an example; any network element can be set up as an additional host.

Figure 12-4 Scenario 3: Using Proxy ARP with Static Routing

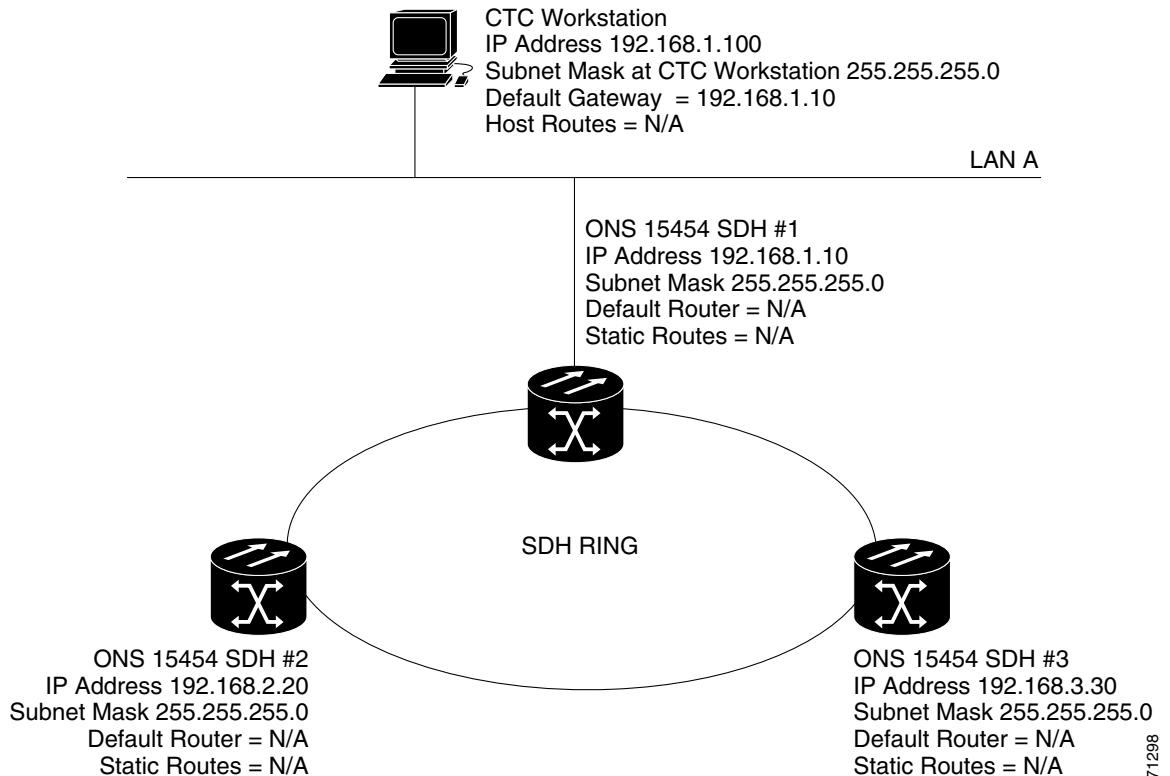


## 12.2.4 Scenario 4: Default Gateway on CTC Computer

Scenario 4 is similar to Scenario 3, but Nodes 2 and 3 reside on different subnets, 192.168.2.0 and 192.168.3.0, respectively (Figure 12-5). Node 1 and the CTC computer are on subnet 192.168.1.0. Proxy ARP is not used because the network includes different subnets. In order for the CTC computer to communicate with Nodes 2 and 3, Node 1 is entered as the default gateway on the CTC computer.



**Figure 12-5 Scenario 4: Default Gateway on a CTC Computer**



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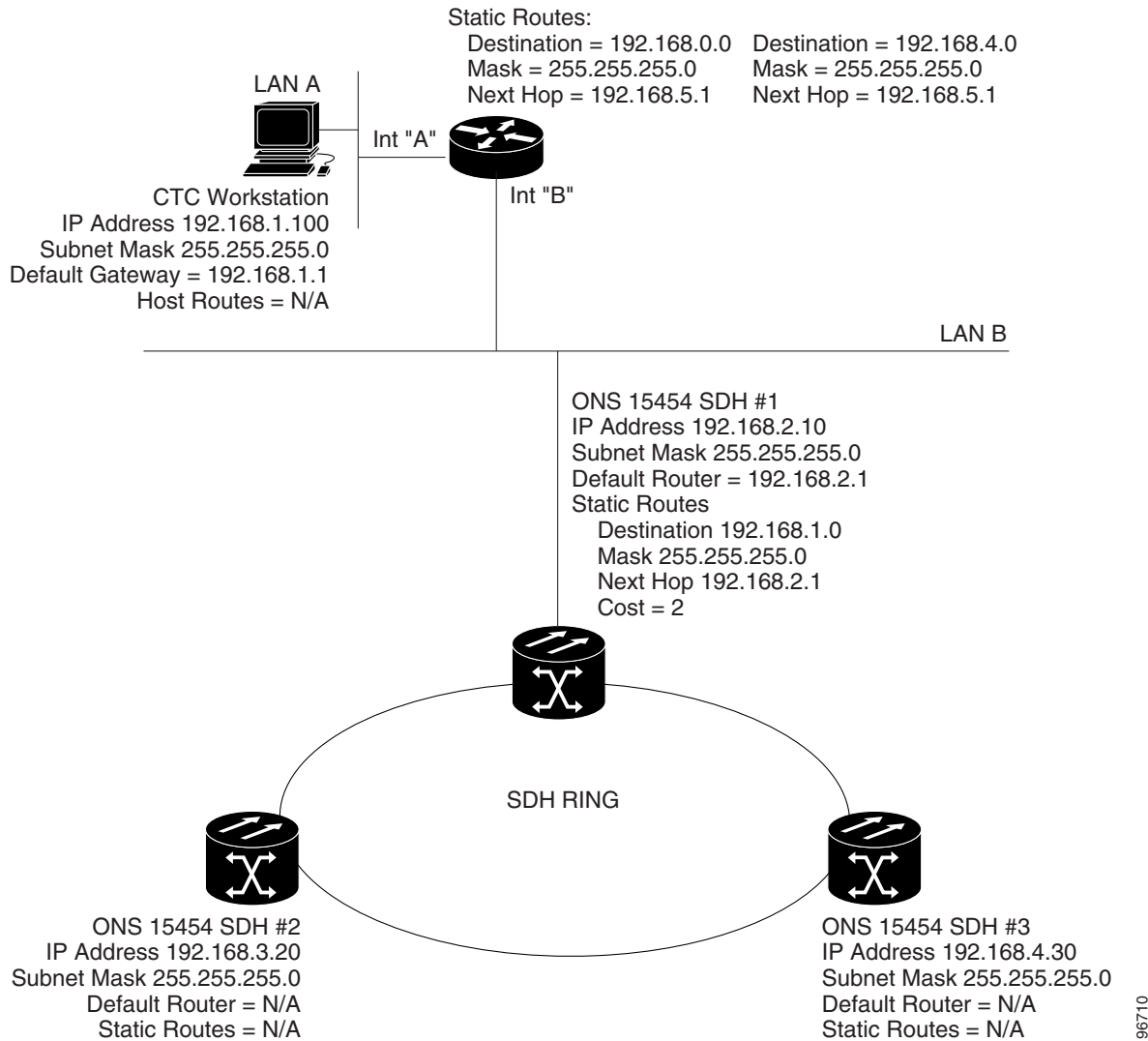
## 12.2.5 Scenario 5: Using Static Routes to Connect to LANs

Static routes are used for two purposes:

- To connect ONS 15454 SDH nodes to CTC sessions on one subnet that are connected by a router to ONS 15454 SDH nodes residing on another subnet. (These static routes are not needed if OSPF is enabled.) Scenario 6 shows an OSPF example.
- To enable multiple CTC sessions among ONS 15454 SDH nodes residing on the same subnet.

In [Figure 12-6](#), one CTC residing on subnet 192.168.1.0 connects to a router through interface A. (The router is not set up with OSPF.) ONS 15454 SDH nodes residing on different subnets are connected through Node 1 to the router through interface B. Because Nodes 2 and 3 are on different subnets, proxy ARP does not enable Node 1 as a gateway. To connect to CTC computers on LAN A, a static route is created on Node 1.

Figure 12-6 Scenario 5: Static Route With One CTC Computer Used as a Destination

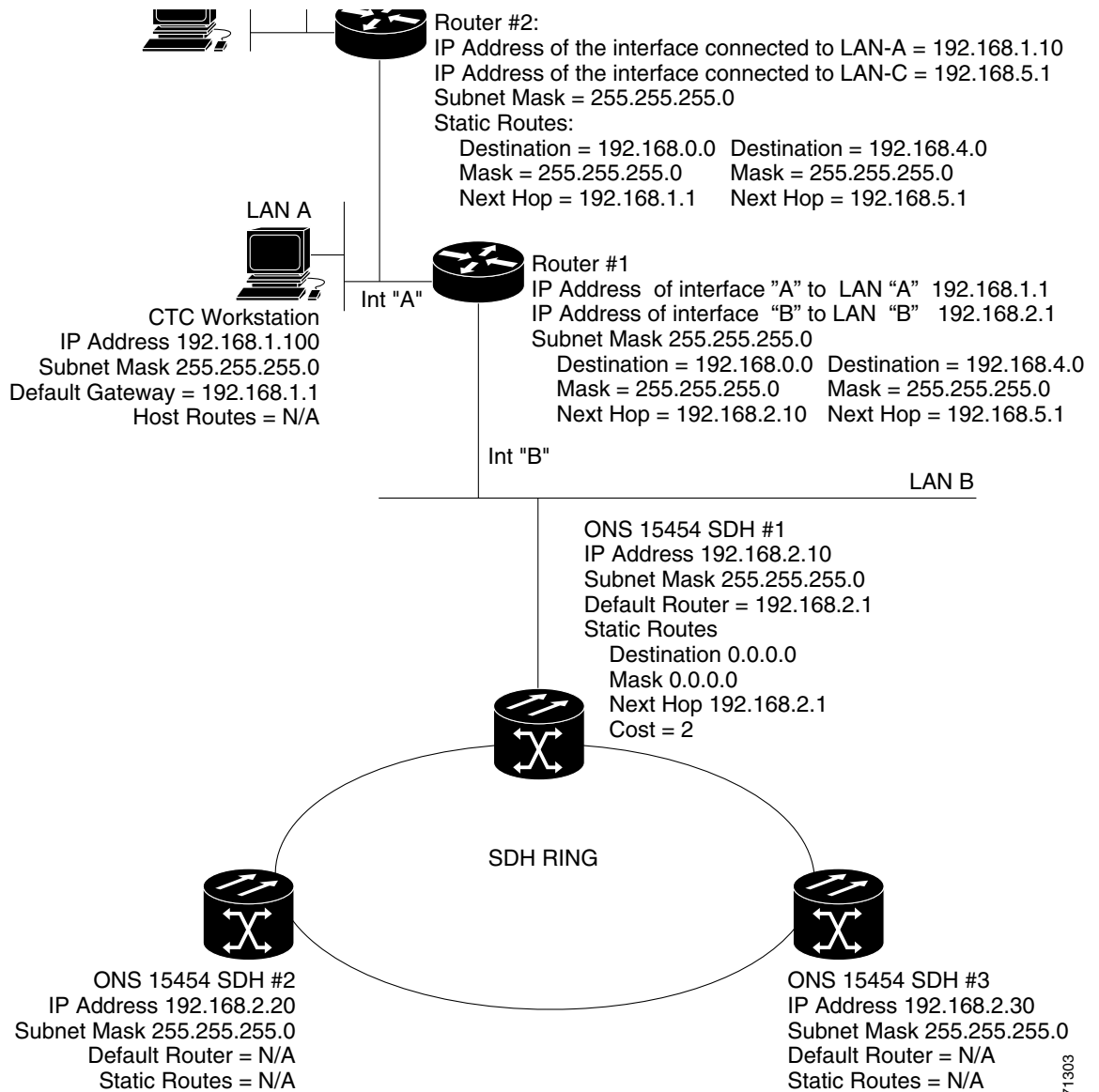


The destination and subnet mask entries control access to the ONS 15454 SDH nodes:

- If a single CTC computer is connected to a router, enter the complete CTC “host route” IP address as the destination with a subnet mask of 255.255.255.255.
- If CTC computers on a subnet are connected to a router, enter the destination subnet (in this example, 192.168.1.0) and a subnet mask of 255.255.255.0.
- If all CTC computers are connected to a router, enter a destination of 0.0.0.0 and a subnet mask of 0.0.0.0. [Figure 12-7](#) shows an example.

The IP address of router interface B is entered as the next hop, and the cost (number of hops from source to destination) is 2.

Figure 12-7 Scenario 5: Static Route With Multiple LAN Destinations



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## 12.2.6 Scenario 6: Using OSPF

Open Shortest Path First (OSPF) is a link state Internet routing protocol. Link state protocols use a "hello protocol" to monitor their links with adjacent routers and to test the status of their links to their neighbors. Link state protocols advertise their directly connected networks and their active links. Each link state router captures the link state "advertisements" and puts them together to create a topology of the entire network or area. From this database, the router calculates a routing table by constructing a shortest path tree. Routes are continuously recalculated to capture ongoing topology changes.

ONS 15454 SDH nodes use the OSPF protocol in internal ONS 15454 SDH networks for node discovery, circuit routing, and node management. You can enable OSPF on the ONS 15454 SDH nodes so that the ONS 15454 SDH topology is sent to OSPF routers on a LAN. Advertising the ONS 15454 SDH network topology to LAN routers eliminates the need to enter static routes for ONS 15454 SDH subnetworks manually.

OSPF divides networks into smaller regions, called areas. An area is a collection of networked end systems, routers, and transmission facilities organized by traffic patterns. Each OSPF area has a unique ID number, known as the area ID. Every OSPF network has one backbone area called "area 0." All other OSPF areas must connect to area 0.

When you enable an ONS 15454 SDH OSPF topology for advertising to an OSPF network, you must assign an OSPF area ID to the ONS 15454 SDH network. Coordinate the area ID number assignment with your LAN administrator. All DCC-connected ONS 15454 SDH nodes should be assigned the same OSPF area ID.

Figure 12-8 shows a network enabled for OSPF.

**Figure 12-8 Scenario 6: OSPF Enabled**

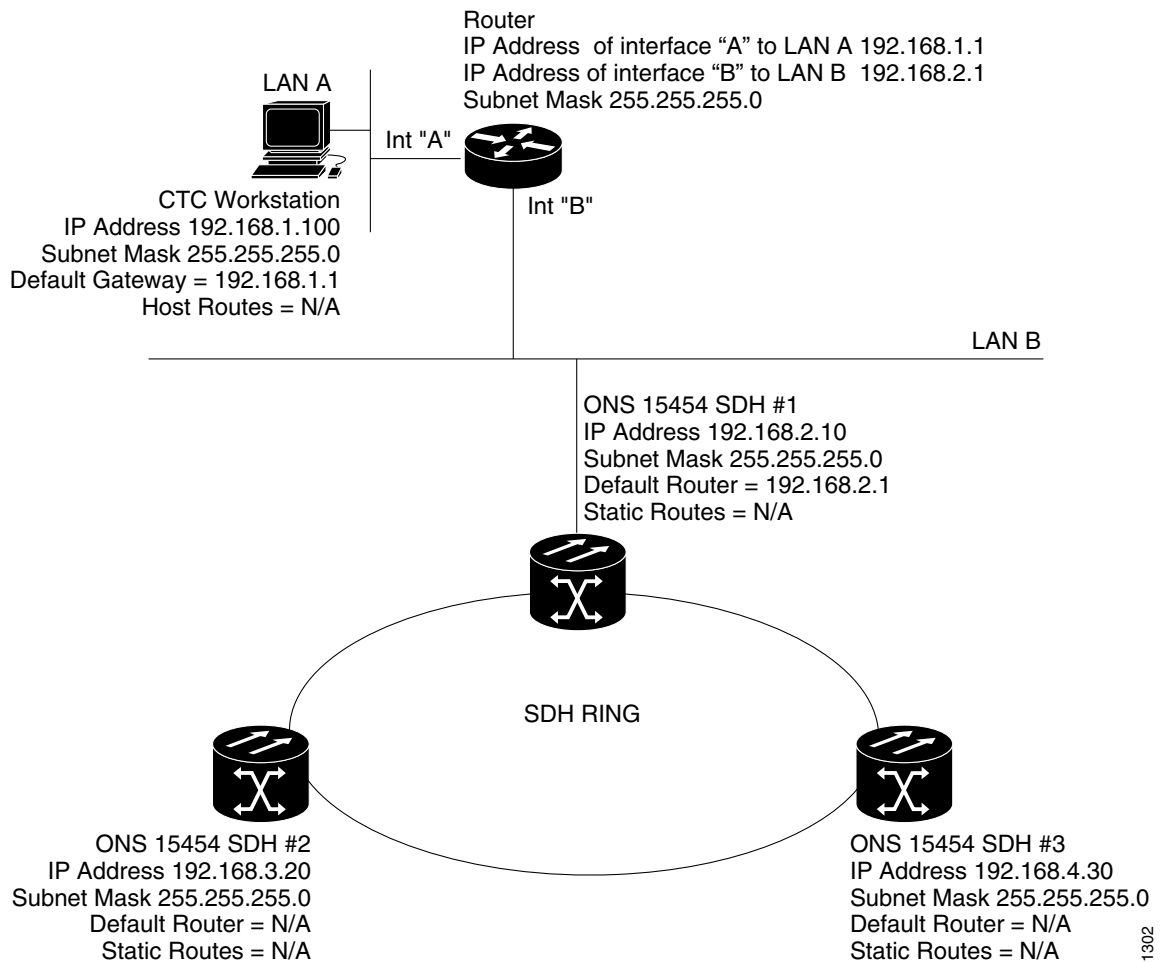
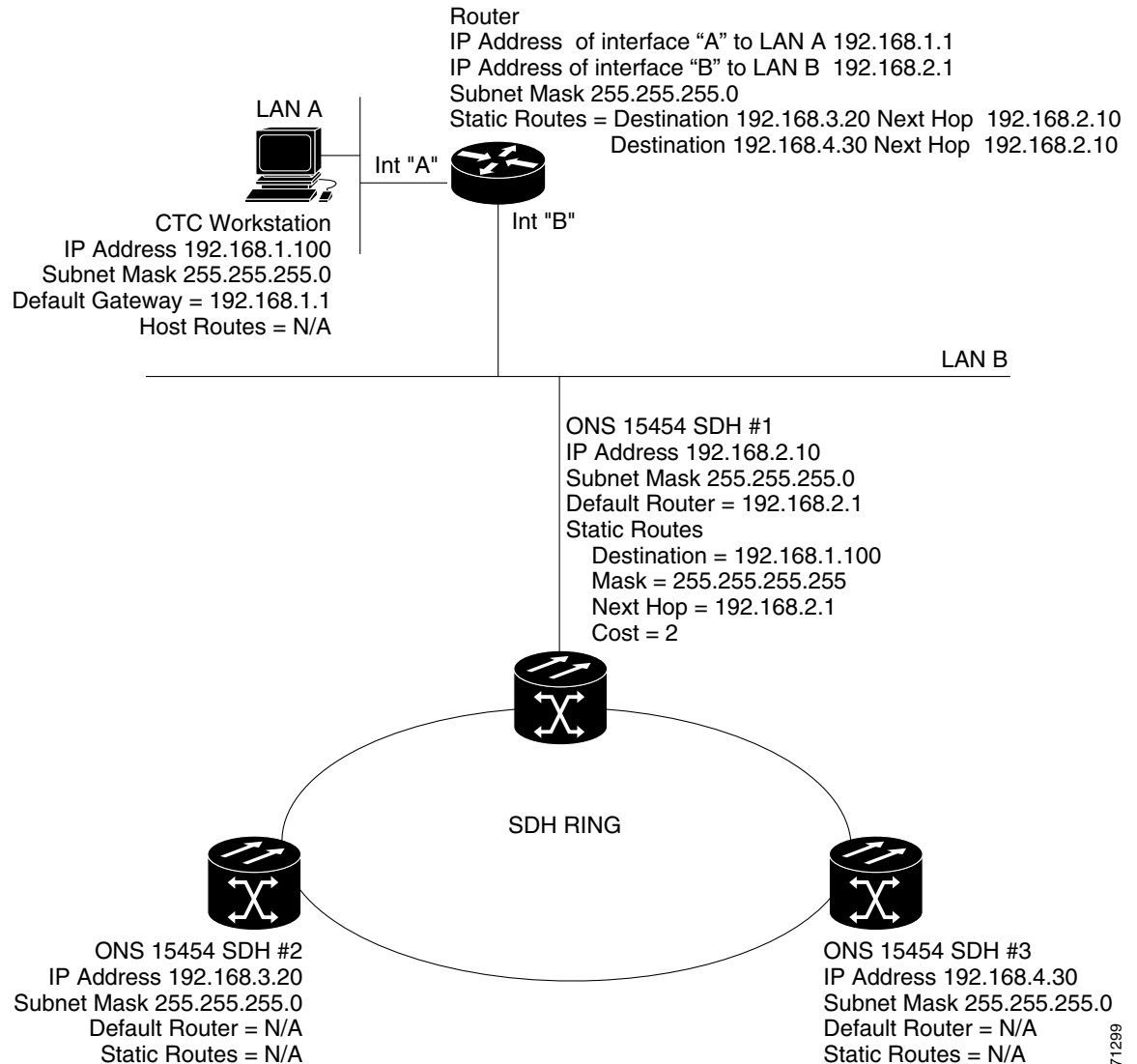


Figure 12-9 shows the same network as Figure 12-8 on page 12-10 without OSPF. Static routes must be manually added to the router for CTC computers on LAN A to communicate with Nodes 2 and 3 because these nodes reside on different subnets.

**Figure 12-9 Scenario 6: OSPF Not Enabled**



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## 12.2.7 Scenario 7: Provisioning the ONS 15454 SDH Proxy Server

The ONS 15454 SDH proxy server is a set of functions that allows you to network ONS 15454 SDH nodes in environments where visibility and accessibility between ONS 15454 SDH nodes and CTC computers must be restricted. For example, you can set up a network so that field technicians and network operating center (NOC) personnel can access the same ONS 15454 SDH nodes while preventing the field technicians from accessing the NOC LAN. To do this, one ONS 15454 SDH is provisioned as a gateway network element (GNE) and the other ONS 15454 SDH nodes are provisioned as external

network elements (ENEs). The GNE tunnels connections between CTC computers and ENE ONS 15454 SDH nodes, providing management capability while preventing access for non-ONS 15454 SDH management purposes.

The ONS 15454 SDH proxy server performs the following tasks:

- Isolates DCC IP traffic from Ethernet (craft port) traffic and accepts packets based on filtering rules. The filtering rules (see [Table 12-3 on page 12-16](#) and [Table 12-4 on page 12-17](#)) depend on whether the packet arrives at the ONS 15454 SDH DCC or TCC2/TCC2P Ethernet interface.
- Processes SNTP (Simple Network Time Protocol) and NTP (Network Time Protocol) requests. ENEs can derive time-of-day from an SNTP/NTP LAN server through the GNE ONS 15454 SDH.
- Processes SNMPv1 traps. The GNE ONS 15454 SDH receives SNMPv1 traps from the ENE ONS 15454 SDH nodes and forwards them to all provisioned SNMPv1 trap destinations.

The ONS 15454 SDH proxy server is provisioned using the Enable proxy server on port check box on the Provisioning > Network > General tab ([Figure 12-10](#)). If checked, the ONS 15454 SDH serves as a proxy for connections between CTC clients and ONS 15454 SDHs that are DCC-connected to the proxy ONS 15454 SDH. The CTC client establishes connections to DCC-connected nodes through the proxy node. The CTC client can connect to nodes that it cannot directly reach from the host on which it runs. If not selected, the node does not proxy for any CTC clients, although any established proxy connections continue until the CTC client exits. In addition, you can set the proxy server as an ENE or a GNE:



**Note**

If you launch CTC against a node through a NAT (Network Address Translation) or PAT (Port Address Translation) router and that node does not have proxy enabled, your CTC session starts and initially appears to be fine. However CTC never receives alarm updates and disconnects and reconnects every two minutes. If the proxy is accidentally disabled, it is still possible to enable the proxy during a reconnect cycle and recover your ability to manage the node, even through a NAT/PAT firewall.

- External Network Element (ENE)—If set as an ENE, the ONS 15454 SDH neither installs nor advertises default or static routes. CTC computers can communicate with the ONS 15454 SDH using the TCC2/TCC2P craft port, but they cannot communicate directly with any other DCC-connected ONS 15454 SDH.

In addition, firewall is enabled, which means that the node prevents IP traffic from being routed between the DCC and the LAN port. The ONS 15454 SDH can communicate with machines connected to the LAN port or connected through the DCC. However, the DCC-connected machines cannot communicate with the LAN-connected machines, and the LAN-connected machines cannot communicate with the DCC-connected machines. A CTC client using the LAN to connect to the firewall-enabled node can use the proxy capability to manage the DCC-connected nodes that would otherwise be unreachable. A CTC client connected to a DCC-connected node can only manage other DCC-connected nodes and the firewall itself.

- Gateway Network Element (GNE)—If set as a GNE, the CTC computer is visible to other DCC-connected nodes and firewall is enabled.
- Proxy-only—If Proxy-only is selected, CTC cannot communicate with any other DCC-connected ONS 15454 SDHs and firewall is not enabled.

Figure 12-10 Proxy Server Gateway Settings

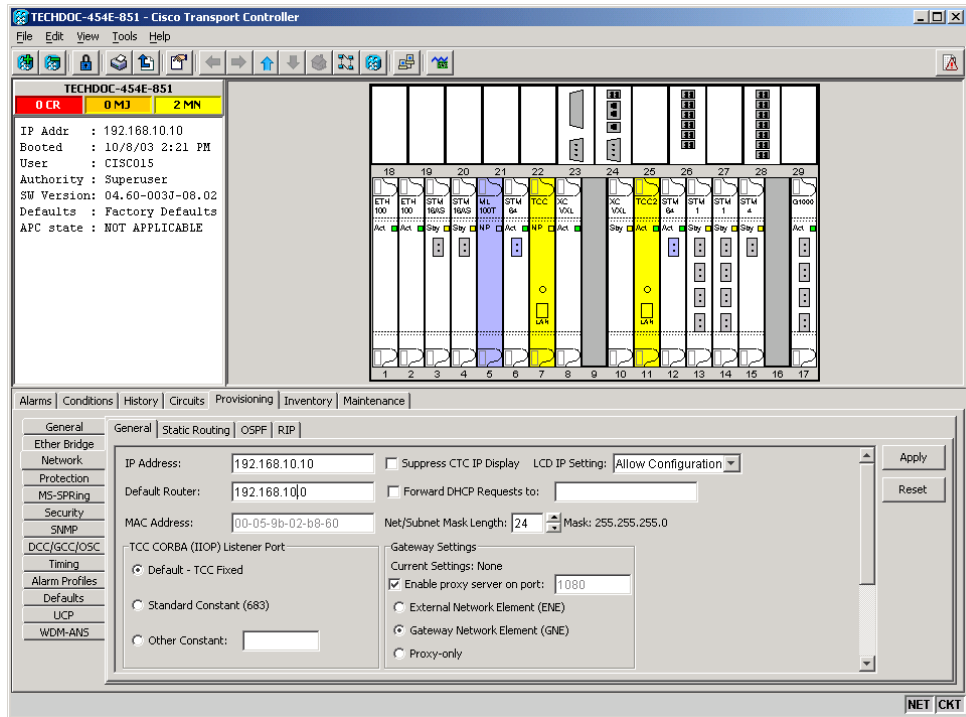


Figure 12-11 shows an ONS 15454 SDH proxy server implementation. A GNE ONS 15454 SDH is connected to a central office LAN and to ENE ONS 15454 SDH nodes. The central office LAN is connected to a NOC LAN, which has CTC computers. The NOC CTC computer and craft technicians must be able to access the ONS 15454 SDH ENEs. However, the craft technicians must be prevented from accessing or seeing the NOC or central office LANs.

In the example, the ONS 15454 SDH GNE is assigned an IP address within the central office LAN and is physically connected to the LAN through its LAN port. ONS 15454 SDH ENEs are assigned IP addresses that are outside the central office LAN and given private network IP addresses. If the ONS 15454 SDH ENEs are collocated, the craft LAN ports could be connected to a hub. However, the hub should have no other network connections.

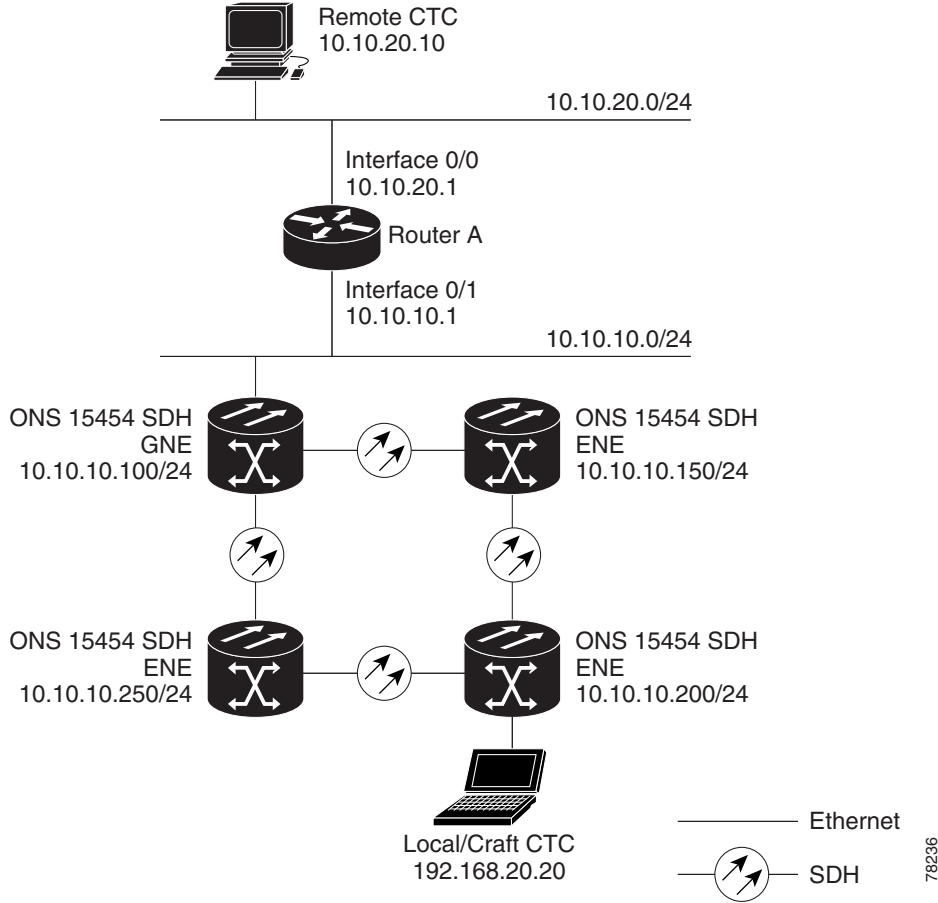
**Figure 12-11 Scenario 7: SDH Proxy Server with GNE and ENEs on the Same Subnet**

Table 12-2 shows recommended settings for ONS 15454 SDH GNEs and ENEs in the configuration shown in Figure 12-11.

**Table 12-2 ONS 15454 SDH Gateway and Element NE Settings**

Setting	ONS 15454 SDH Gateway NE	ONS 15454 SDH Element NE
Craft Access Only	Off	On
Enable Proxy	On	On
Enable Firewall	On	On
OSPF	Off	Off
SNTP Server (if used)	SNTP server IP address	Set to ONS 15454 SDH GNE IP address
SNMP (if used)	SNMPv1 trap destinations	Set SNMPv1 trap destinations to ONS 15454 SDH GNE, port 391

Figure 12-12 shows the same proxy server implementation with ONS 15454 SDH ENEs on different subnets. In the example, ONS 15454 SDH GNEs and ENEs are provisioned with the settings shown in Table 12-2.



Figure 12-12 Scenario 7: ONS 15454 SDH Proxy Server with GNE and ENEs on Different Subnets

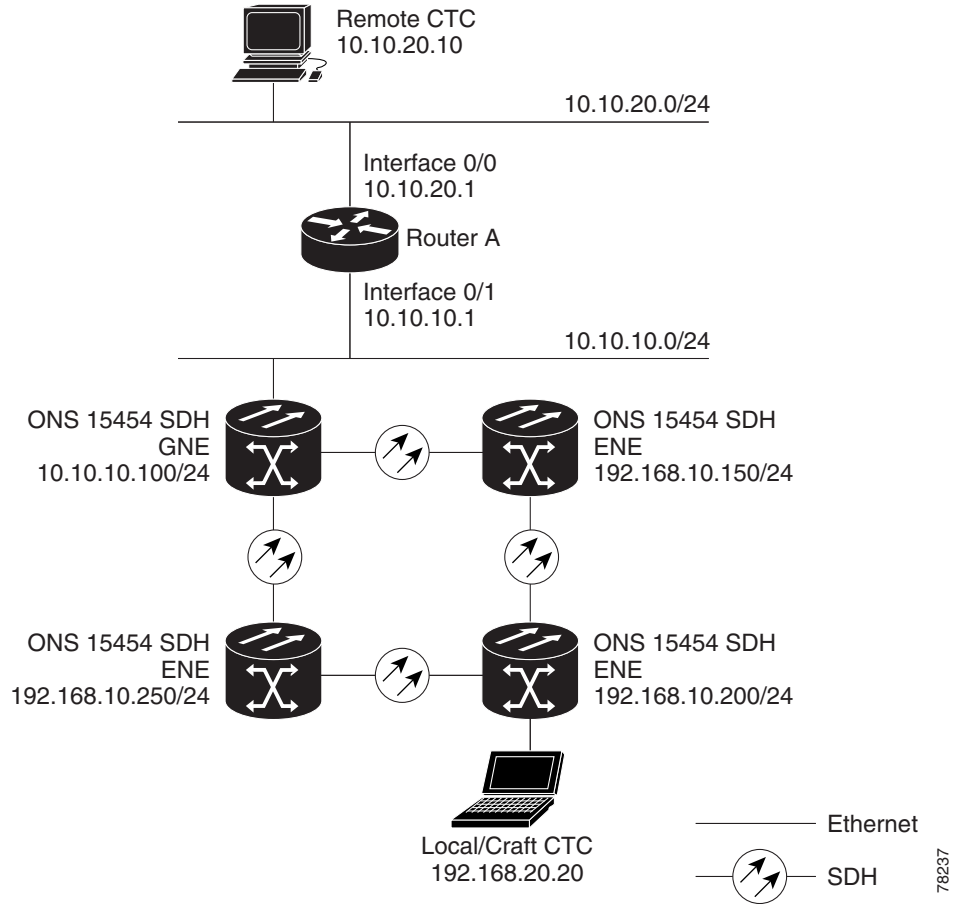


Figure 12-13 shows the implementation with ONS 15454 SDH ENEs in multiple rings. In the example, ONS 15454 SDH GNEs and ENEs are provisioned with the settings shown in Table 12-2 on page 12-14.

Figure 12-13 Scenario 7: ONS 15454 SDH Proxy Server With ENEs on Multiple Rings

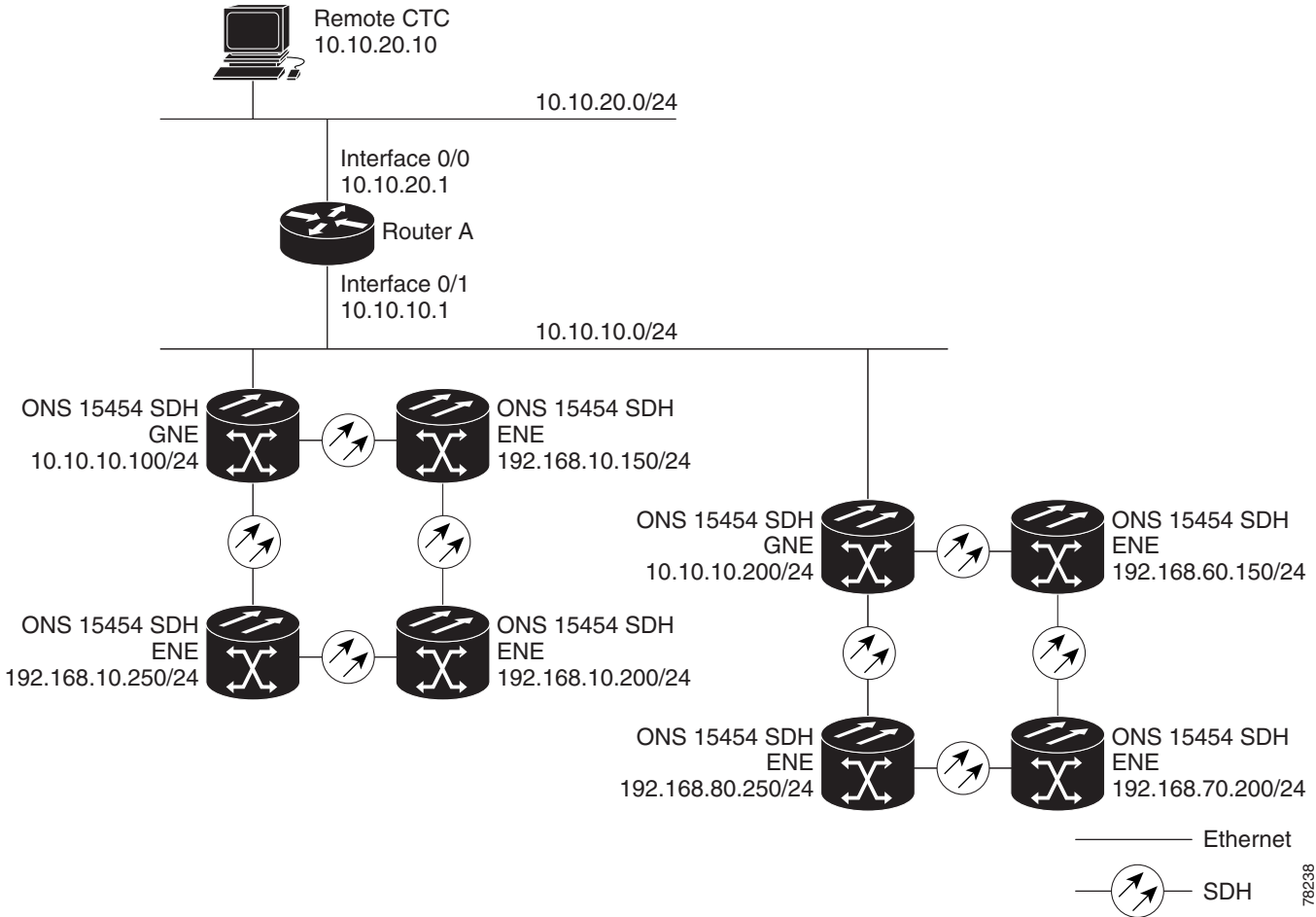


Table 12-3 shows the rules the ONS 15454 SDH follows to filter packets when Enable Firewall is enabled.

Table 12-3 Proxy Server Firewall Filtering Rules

Packets Arriving At:	Are Accepted if the IP Destination Address is:
TCC2/TCC2P Ethernet interface	<ul style="list-style-type: none"> <li>The ONS 15454 SDH itself</li> <li>The ONS 15454 SDH node's subnet broadcast address</li> <li>Within the 224.0.0.0/8 network (reserved network used for standard multicast messages)</li> <li>Subnet mask = 255.255.255.255</li> </ul>
DCC interface	<ul style="list-style-type: none"> <li>The ONS 15454 SDH itself</li> <li>Any destination connected through another DCC interface</li> <li>Within the 224.0.0.0/8 network</li> </ul>

If the packet is addressed to the ONS 15454 SDH, additional rules shown in [Table 12-4](#) apply. Rejected packets are silently discarded.

**Table 12-4 Proxy Server Firewall Filtering Rules When Packet Addressed to ONS 15454 SDH**

Packets Arriving At	Accepts	Rejects
TCC2/TCC2P Ethernet interface	<ul style="list-style-type: none"> <li>All UDP packets except those in the Rejected column</li> </ul>	<ul style="list-style-type: none"> <li>UDP packets addressed to the SNMP trap relay port (391)</li> </ul>
DCC interface	<ul style="list-style-type: none"> <li>All UDP packets</li> <li>All TCP packets except those in the Rejected column</li> <li>OSPF packets</li> <li>ICMP packets</li> </ul>	<ul style="list-style-type: none"> <li>TCP packets addressed to the Telnet port</li> <li>TCP packets addressed to the proxy server port</li> <li>All packets other than UDP, TCP, OSPF, and ICMP.</li> </ul>

If you implement the proxy server, keep the following rules in mind:

- All DCC-connected ONS 15454 SDH nodes on the same Ethernet segment must have the same Craft Access Only setting. Mixed values produce unpredictable results, and might leave some nodes unreachable through the shared Ethernet segment.
- All DCC-connected ONS 15454 SDH nodes on the same Ethernet segment must have the same Enable Firewall setting. Mixed values produce unpredictable results. Some nodes might become unreachable.
- If you check Enable Firewall, always check Enable Proxy. If Enable Proxy is not checked, CTC cannot see nodes on the DCC side of the ONS 15454 SDH.
- If Craft Access Only is checked, check Enable Proxy. If Enable Proxy is not checked, CTC cannot see nodes on the DCC side of the ONS 15454 SDH.

If nodes become unreachable in cases 1, 2, and 3, you can correct the setting by performing one of the following:

- Disconnect the craft computer from the unreachable ONS 15454 SDH. Connect to the ONS 15454 SDH through another ONS 15454 SDH in the network that has a DCC connection to the unreachable ONS 15454 SDH.
- Disconnect the Ethernet cable from the unreachable ONS 15454 SDH. Connect a CTC computer directly to the ONS 15454 SDH.

## 12.2.8 Scenario 8: Dual GNEs on a Subnet

The ONS 15454 SDH provides GNE load balancing, which allows CTC to reach ENEs over multiple GNEs without the ENEs being advertised over OSPF. This feature allows a network to quickly recover from the loss of GNE, even if the GNE is on a different subnet. If a GNE fails, all connections through that GNE fail. CTC disconnects from the failed GNE and from all ENEs for which the GNE was a proxy, and then reconnects through the remaining GNEs. GNE load balancing reduces the dependency on the launch GNE and DCC bandwidth, both of which enhance CTC performance. [Figure 12-14](#) shows a network with dual GNEs on the same subnet.

Figure 12-14 Scenario 8: Dual GNEs on the Same Subnet

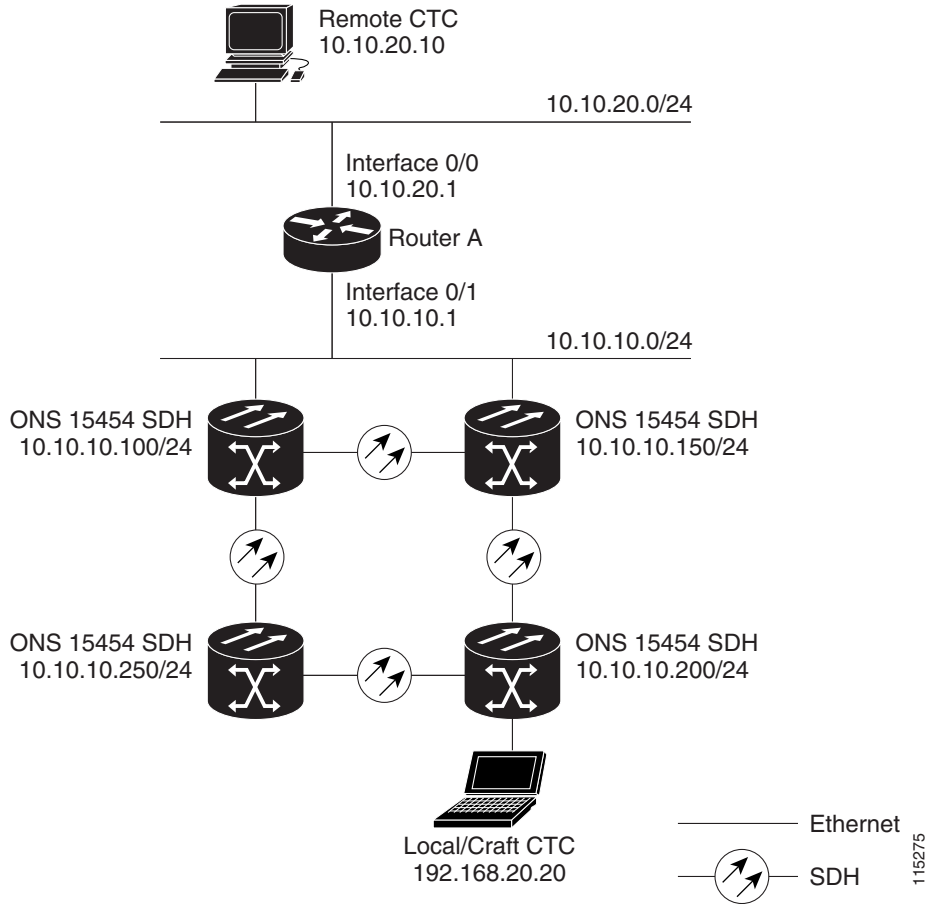
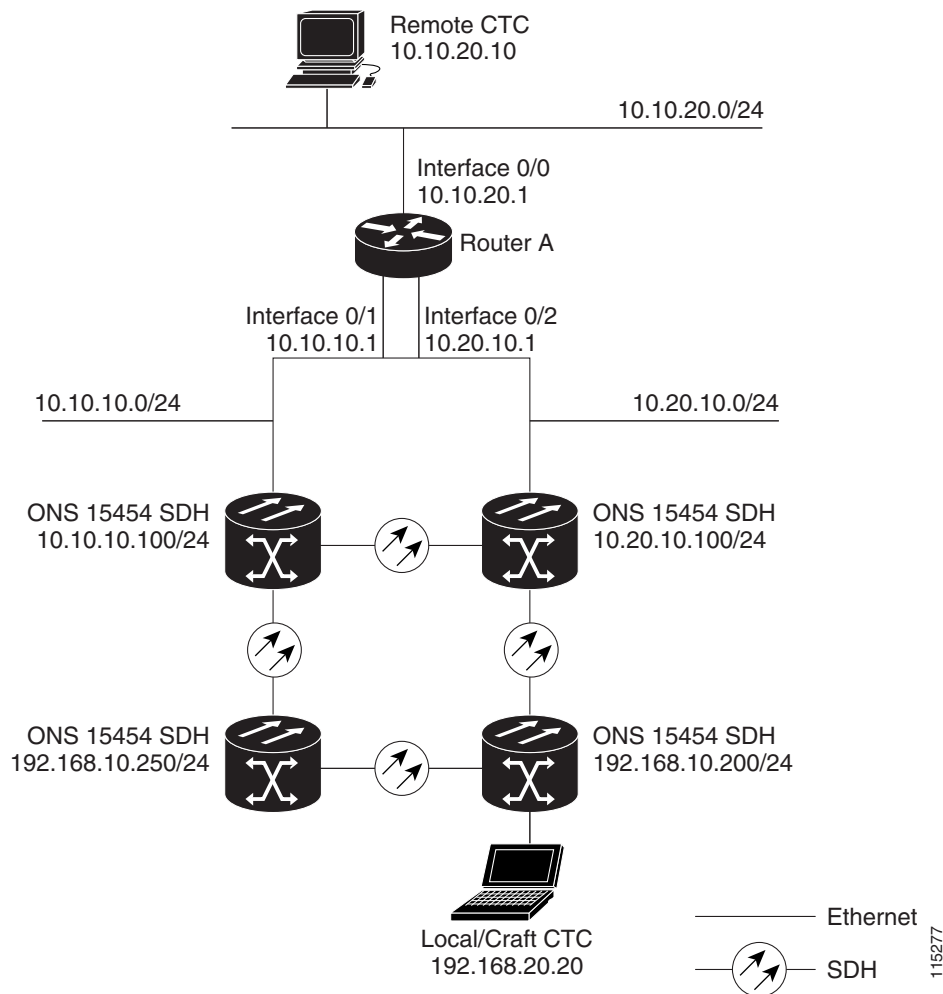


Figure 12-15 shows a network with dual GNEs on different subnets.

**Figure 12-15 Scenario 8: Dual GNEs on Different Subnets**



## 12.2.9 Scenario 9: IP Addressing with Secure Mode Enabled

TCC2/TCC2P cards provide a secure mode option allowing you to provision two IP addresses for the ONS 15454. One IP address is provisioned for the ONS 15454 SDH MIC-C/T/P LAN port. The other IP address is provisioned for the TCC2/TCC2P TCP/IP craft port. The two IP addresses provide an additional layer of separation between the craft access port and the ONS 15454 SDH LAN. If secure mode is enabled, the IP addresses provisioned for the TCC2/TCC2P TCP/IP ports must follow general IP addressing guidelines. In addition, TCC2/TCC2P IP addresses must reside on a different subnet from the ONS 15454 SDH MIC-C/T/P port and ONS 15454 SDH default router IP addresses.

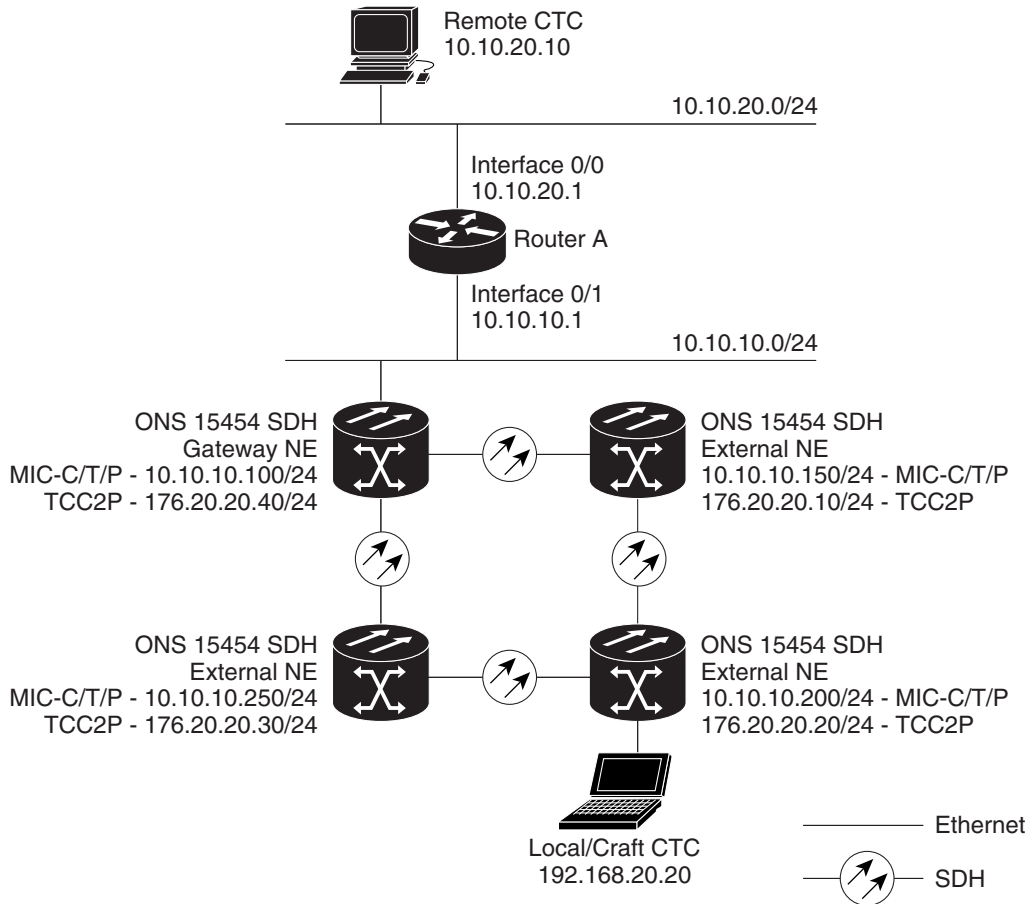
The IP address assigned to the MIC-C/T/P LAN port becomes a private address, which is used to connect the ONS 15454 SDH GNE to an OSS (Operations Support System) through a central office LAN or private enterprise network. In secure mode, the MIC-C/T/P LAN IP address is not displayed on the CTC node view or to a technician directly connected to the node by default. This default can be changed to allow the MIC-C/T/P IP address to be displayed on CTC only by a Superuser.

Figure 12-16 shows an example of ONS 15454 SDH nodes on the same subnet with secure mode enabled. In the example, TCC2P port addresses are on a different subnet from the node MIC-C/T/P IP addresses.

**Note**

Secure mode is not available if TCC2 cards are installed, or if only one TCC2P card is installed.

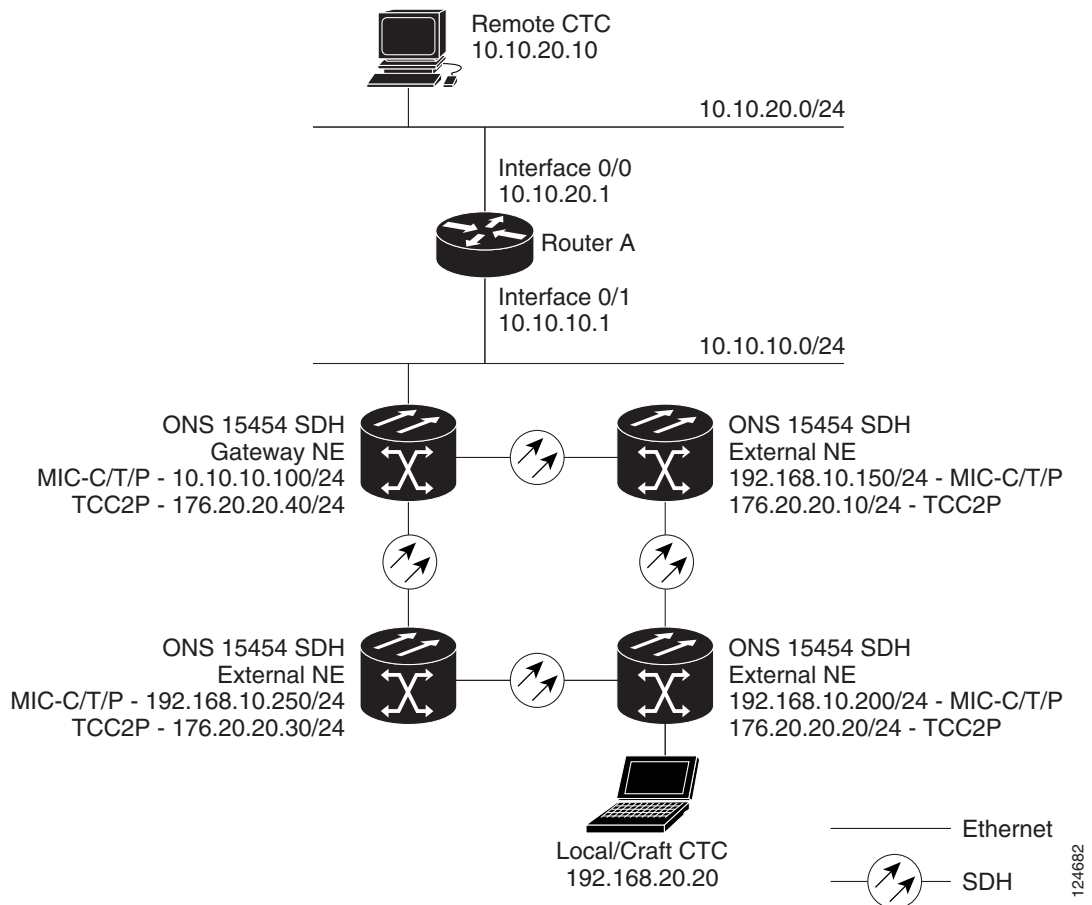
**Figure 12-16 Scenario 9: ONS 15454 SDH GNE and ENEs on the Same Subnet with Secure Mode Enabled**



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Figure 12-17 shows an example of ONS 15454 nodes connected to a router with secure mode enabled. In the example, TCC2P port addresses are on a different subnet from the node MIC-C/T/P IP addresses.

**Figure 12-17 Scenario 9: ONS 15454 SDH GNE and ENEs on Different Subnets with Secure Mode Enabled**



## 12.3 Provisionable Patchcords

A provisionable patchcord is a user-provisioned link that is advertised by OSPF throughout the network. Provisionable patchcords, also called virtual links, are needed in the following situations:

- An optical port is connected to a transponder or muxponder client port provisioned in transparent mode.
- An optical ITU port is connected to a DWDM optical channel card.
- Two transponder or muxponder trunk ports are connected to a DWDM optical channel card and the generic control channel (GCC) is carried transparently through the ring.
- Transponder or muxponder client and trunk ports are in a regenerator group, the cards are in transparent mode, and DCC/GCC termination is not available.

Provisionable patchcords are required on both ends of a physical link. The provisioning at each end includes a local patchcord ID, slot/port information, remote IP address, and remote patchcord ID. Patchcords appear as dashed lines in CTC network view.

Table 12-5 lists the supported card combinations for client and trunk ports in a provisionable patchcord.

**Table 12-5 Cisco ONS 15454 SDH Client/Trunk Card Combinations for Provisionable Patchcords**

Trunk Cards	Client Cards						
	MXP_2.5G_10G/ TXP_MR_10G	TXP(P)_MR_2.5G	MXP_2.5G_10E / TXP_MR_10E	32MUX-O 32DMX-O	32-WSS/ 32-DMX	ADxC	4MD
MXP_2.5G_10G/ TXP_MR_10G	—	—	—	Yes	Yes	Yes	Yes
TXP(P)_MR_2.5G	—	—	—	Yes	Yes	Yes	Yes
MXP_2.5G_10E/ TXP_MR_10E	—	—	—	Yes	Yes	Yes	Yes
MXP(P)_MR_2.5G	—	—	—	Yes	Yes	Yes	Yes
OC-192	Yes	—	Yes	—	—	—	—
OC-48	Yes	Yes	Yes	—	—	—	—
OC-192 ITU	—	—	—	Yes	Yes	Yes	Yes
OC-48 ITU	—	—	—	Yes	Yes	Yes	Yes



**Note**

If the OCSM card is installed in Slot 8, provisionable patchcords from OC-N ports to the following cards are not supported on the same node: MXP\_2.5G\_10G, TXP\_MR\_10G, TXP(P)\_MR\_2.5G, MXP\_2.5G\_10E, TXP\_MR\_10E, 32MUX-O, 32DMX-O, 32-WSS, or 32-DMX.

Table 12-6 lists the supported card combinations for client-to-client ports in a patchcord.

**Table 12-6 Cisco ONS 15454 SDH Client/Client Card Combinations for Provisionable Patchcords**

Client Cards	MXP_2.5G_10G/ TXP_MR_10G	TXP(P)_MR_2.5G	MXP_2.5G_10E/ TXP_MR_10E
MXP_2.5G_10G/ TXP_MR_10G	Yes	—	Yes
TXP(P)_MR_2.5G	—	Yes	—
MXP_2.5G_10E/ TXP_MR_10E	Yes	—	Yes



Table 12-7 lists the supported card combinations for trunk-to-trunk ports in a patchcord.

**Table 12-7 Cisco ONS 15454 SDH Trunk/Trunk Card Combinations for Provisionable Patchcords**

Trunk Cards	MXP_2.5G_10G/ TXP_MR_10G	TXP(P)_MR_2.5G	MXP_2.5G_10E/ TXP_MR_10E
MXP_2.5G_10G/ TXP_MR_10G	Yes	—	Yes
TXP(P)_MR_2.5G	—	Yes	—
MXP_2.5G_10E/ TXP_MR_10E	Yes	—	Yes

Optical ports have the following requirements when used in a provisionable patchcord:

- An optical port connected to transponder/muxponder port or add/drop multiplexer or multiplexer/demultiplexer port requires an SDCC/LDCC termination.
- If the optical port is the protection port in a 1+1 group, the working port must have an SDCC/LDCC termination provisioned.
- If the remote end of a patchcord is Y-cable protected or is an add/drop multiplexer or multiplexer/demultiplexer port, an optical port requires two patchcords.

Transponder and muxponder ports have the following requirements when used in a provisionable patchcord:

- Two patchcords are required when a transponder/muxponder port is connected to an add/drop multiplexer or multiplexer/demultiplexer port. CTC automatically prompts the user to set up the second patchcord.
- If a patchcord is on a client port in a regenerator group, the other end of the patchcord must be on the same node and on a port within the same regenerator group.
- A patchcord is allowed on a client port only if the card is in transparent mode.

DWDM cards support provisionable patchcords only on optical channel ports. Each DWDM optical channel port can have only one provisionable patchcord.



**Note**

For TXP, MXP, and DWDM card information, refer to the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

## 12.4 Routing Table

ONS 15454 SDH routing information is displayed on the Maintenance > Routing Table tabs. The routing table provides the following information:

- Destination—Displays the IP address of the destination network or host.
- Mask—Displays the subnet mask used to reach the destination host or network.
- Gateway—Displays the IP address of the gateway used to reach the destination network or host.
- Usage—Shows the number of times the listed route has been used.

- Interface—Shows the ONS 15454 SDH interface used to access the destination. Values are:
  - motfcc0—The ONS 15454 SDH Ethernet interface, that is, the RJ-45 jack on the TCC2/TCC2P card and the LAN connection on the MIC-C/T/P FMEC
  - pdcc0—An SDCC interface, that is, an STM-N trunk card identified as the SDCC termination
  - lo0—A loopback interface

Table 12-8 shows sample routing entries for an ONS 15454 SDH.

**Table 12-8 Sample Routing Table Entries**

Entry	Destination	Mask	Gateway	Interface
1	0.0.0.0	0.0.0.0	172.20.214.1	motfcc0
2	172.20.214.0	255.255.255.0	172.20.214.92	motfcc0
3	172.20.214.92	255.255.255.255	127.0.0.1	lo0
4	172.20.214.93	255.255.255.255	0.0.0.0	pdcc0
5	172.20.214.94	255.255.255.255	172.20.214.93	pdcc0

Entry 1 shows the following:

- Destination (0.0.0.0) is the default route entry. All undefined destination network or host entries on this routing table are mapped to the default route entry.
- Mask (0.0.0.0) is always 0 for the default route.
- Gateway (172.20.214.1) is the default gateway address. All outbound traffic that cannot be found in this routing table or is not on the node's local subnet are sent to this gateway.
- Interface (motfcc0) indicates that the ONS 15454 SDH Ethernet interface is used to reach the gateway.

Entry 2 shows the following:

- Destination (172.20.214.0) is the destination network IP address.
- Mask (255.255.255.0) is a 24-bit mask, meaning all addresses within the 172.20.214.0 subnet can be a destination.
- Gateway (172.20.214.92) is the gateway address. All outbound traffic belonging to this network is sent to this gateway.
- Interface (motfcc0) indicates that the ONS 15454 SDH Ethernet interface is used to reach the gateway.

Entry 3 shows the following:

- Destination (172.20.214.92) is the destination host IP address.
- Mask (255.255.255.255) is a 32 bit mask, meaning only the 172.20.214.92 address is a destination.
- Gateway (127.0.0.1) is a loopback address. The host directs network traffic to itself using this address.
- Interface (lo0) indicates that the local loopback interface is used to reach the gateway.

Entry 4 shows the following:

- Destination (172.20.214.93) is the destination host IP address.
- Mask (255.255.255.255) is a 32 bit mask, meaning only the 172.20.214.93 address is a destination.

- Gateway (0.0.0.0) means the destination host is directly attached to the node.
- Interface (pdcc0) indicates that a SDH SDCC interface is used to reach the destination host.

Entry 5 shows a DCC-connected node that is accessible through a node that is not directly connected:

- Destination (172.20.214.94) is the destination host IP address.
- Mask (255.255.255.255) is a 32-bit mask, meaning only the 172.20.214.94 address is a destination.
- Gateway (172.20.214.93) indicates that the destination host is accessed through a node with IP address 172.20.214.93.
- Interface (pdcc0) indicates that a SDH SDCC interface is used to reach the gateway.

## 12.5 External Firewalls

This section provides sample access control lists for external firewalls. [Table 12-9](#) lists the ports that are used by the TCC2/TCC2P card.

**Table 12-9** Ports Used by the TCC2/TCC2P

Port	Function	Action <sup>1</sup>
0	Never used	D
20	FTP	D
21	FTP control	D
22	SSH	D
23	Telnet	D
80	HTTP	D
111	SUNRPC	NA
161	SNMP traps destinations	D
162	SNMP traps destinations	D
513	rlogin	D
683	CORBA IIOP	OK
1080	Proxy server (socks)	D
2001-2017	I/O card Telnet	D
2018	DCC processor on active TCC2/TCC2P	D
2361	TL1	D
3082	Raw TL1	D
3083	TL1	D
5001	BLSR server port	D
5002	BLSR client port	D
7200	SNMP alarm input port	D
9100	EQM port	D
9401	TCC boot port	D
9999	Flash manager	D

**Table 12-9** Ports Used by the TCC2/TCC2P (continued)

Port	Function	Action <sup>1</sup>
10240-12287	Proxy client	D
57790	Default TCC listener port	OK

1. D = deny, NA = not applicable, OK = do not deny

The following access control list (ACL) example shows a firewall configuration when the proxy server gateway setting is not enabled. In the example, the CTC workstation's address is 192.168.10.10, and the ONS 15454 SDH address is 10.10.10.100. The firewall is attached to the GNE CTC, so inbound is CTC to the GNE and outbound is from the GNE to CTC. The CTC Common Object Request Broker Architecture (CORBA) Standard constant is 683 and the TCC CORBA Default TCC Fixed (57790).

```
access-list 100 remark *** Inbound ACL, CTC -> NE ***
access-list 100 remark
access-list 100 permit tcp host 192.168.10.10 any host 10.10.10.100 eq www
access-list 100 remark *** allows initial contact with ONS 15454 SDH using http (port 80)
access-list 100 remark
access-list 100 permit tcp host 192.168.10.10 683 host 10.10.10.100 eq 57790
access-list 100 remark *** allows CTC communication with ONS 15454 SDH GNE (port 57790)
***
access-list 101 remark *** Outbound ACL, NE -> CTC ***
access-list 101 remark
access-list 101 permit tcp host 10.10.10.100 any host 192.168.10.10 eq 683
access-list 101 remark *** allows alarms etc., from ONS 15454 SDH (random port) to the CTC
workstation (port 683) ***
access-list 100 remark
access-list 101 permit tcp host 10.10.10.100 host 192.168.10.10 established
access-list 101 remark *** allows ACKs from ONS 15454 SDH GNE to CTC ***
```

The following ACL example shows a firewall configuration when the proxy server gateway setting is enabled. As with the first example, the CTC workstation address is 192.168.10.10 and the ONS 15454 SDH address is 10.10.10.100. The firewall is attached to the GNE CTC, so inbound is CTC to the GNE and outbound is from the GNE to CTC. CTC CORBA Standard constant (683) and TCC CORBA Default TCC Fixed (57790).

```
access-list 100 remark *** Inbound ACL, CTC -> NE ***
access-list 100 remark
access-list 100 permit tcp host 192.168.10.10 any host 10.10.10.100 eq www
access-list 100 remark *** allows initial contact with the 15454 SDH using http (port 80)
***
access-list 100 remark
access-list 100 permit tcp host 192.168.10.10 683 host 10.10.10.100 eq 57790
access-list 100 remark *** allows CTC communication with the 15454 SDH GNE (port 57790)
***
access-list 100 remark
access-list 100 permit tcp host 192.168.10.10 683 host 10.10.10.100 eq 1080
access-list 100 remark *** allows CTC communication with the 15454 SDH GNE proxy server
(port 1080) ***
access-list 100 remark
access-list 100 permit tcp host 192.168.10.10 683 host 10.10.10.100 range 10240 10495
access-list 100 remark *** allows CTC communication with the 15454 SDH ENES (ports 10240 -
10495) via the GNE proxy server
***
access-list 100 remark
access-list 100 permit tcp host 192.168.10.10 host 10.10.10.100 established
access-list 100 remark *** allows ACKs from CTC to the 15454 SDH GNE ***

access-list 101 remark *** Outbound ACL, NE -> CTC ***
```

```
access-list 101 remark
access-list 101 permit tcp host 10.10.10.100 any host 192.168.10.10 eq 683
access-list 101 remark *** allows alarms and other communications from the 15454 SDH
(random port) to the CTC workstation
(port 683) ***
access-list 100 remark
access-list 101 permit tcp host 10.10.10.100 host 192.168.10.10 established
access-list 101 remark *** allows ACKs from the 15454 SDH GNE to CTC ***
```

## 12.6 Open GNE

The ONS 15454 SDH can communicate with non-ONS nodes that do not support point-to-point protocol (PPP) vendor extensions or OSPF type 10 opaque link-state advertisements (LSA), both of which are necessary for automatic node and link discovery. An open GNE configuration allows the DCC-based network to function as an IP network for non-ONS nodes.

To configure an open GNE network, you can provision SDCC, LDCC, and GCC terminations to include a far-end, non-ONS node using either the default IP address of 0.0.0.0 or a specified IP address. You provision a far-end, non-ONS node by checking the “Far End is Foreign” check box during SDCC, LDCC, and GCC creation. The default 0.0.0.0 IP address allows the far-end, non-ONS node to provide the IP address; if you set an IP address other than 0.0.0.0, a link is established only if the far-end node identifies itself with that IP address, providing an extra level of security.

By default, the proxy server only allows connections to discovered ONS peers and the firewall blocks all IP traffic between the DCC network and LAN. You can, however, provision proxy tunnels to allow up to 12 additional destinations for SOCKS version 5 connections to non-ONS nodes. You can also provision firewall tunnels to allow up to 12 additional destinations for direct IP connectivity between the DCC network and LAN. Proxy and firewall tunnels include both a source and destination subnet. The connection must originate within the source subnet and terminate within the destination subnet before either the SOCKS connection or IP packet flow is allowed.

To set up proxy and firewall subnets in CTC, use the Provisioning > Network > Proxy and Firewalls subtabs. The availability of proxy and/or firewall tunnels depends on the network access settings of the node:

- If the node is configured with the proxy server enabled in GNE or ENE mode, you must set up a proxy tunnel and/or a firewall tunnel.
- If the node is configured with the proxy server enabled in proxy-only mode, you can set up proxy tunnels. Firewall tunnels are not allowed.
- If the node is configured with the proxy server disabled, neither proxy tunnels or firewall tunnels are allowed.

Figure 12-18 shows an example of a foreign node connected to the DCC network. Proxy and firewall tunnels are useful in this example because the GNE would otherwise block IP access between the PC and the foreign node.

Figure 12-18 Proxy and Firewall Tunnels for Foreign Terminations

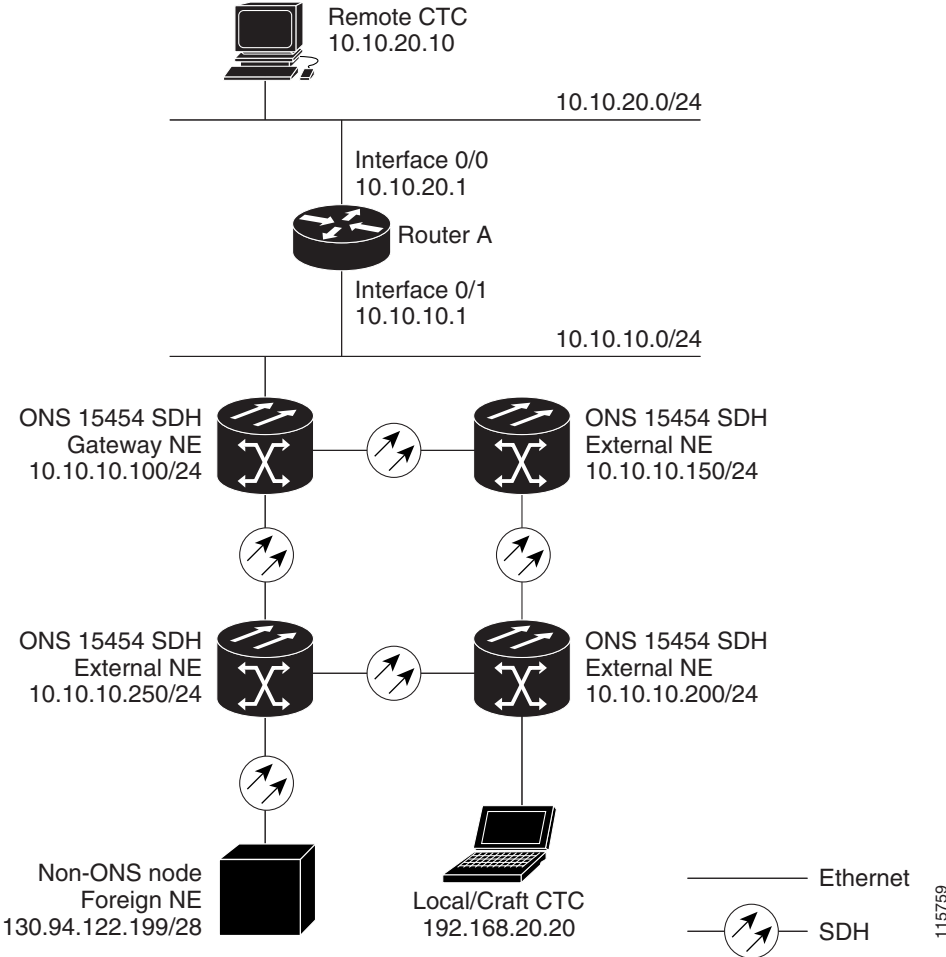
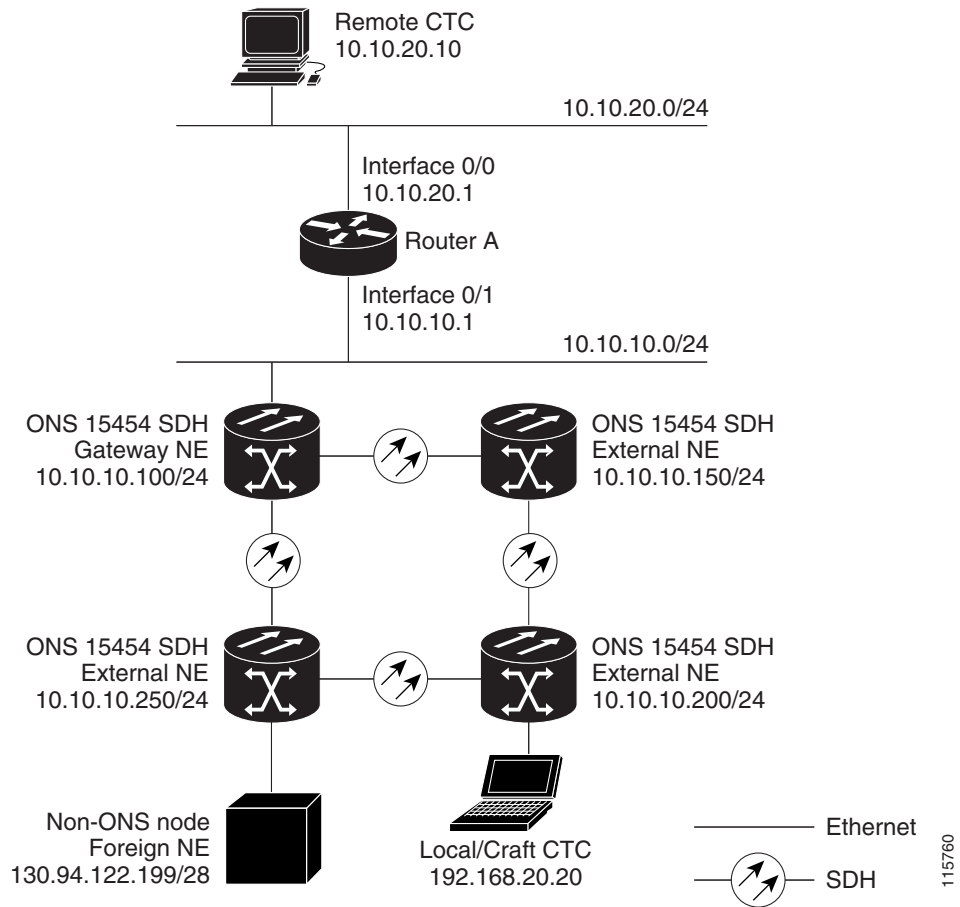


Figure 12-19 shows a remote node connected to an ENE Ethernet port. Proxy and firewall tunnels are useful in this example because the GNE would otherwise block IP access between the PC and foreign node. This configuration also requires a firewall tunnel on the ENE.

**Figure 12-19 Foreign Node Connection to an ENE Ethernet Port**



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## Alarm Monitoring and Management

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This chapter explains how to manage alarms with Cisco Transport Controller (CTC). To troubleshoot specific alarms, refer to the *Cisco ONS 15454 SDH Troubleshooting Guide*. Chapter topics include:

- [13.1 Overview, page 13-1](#)
- [13.2 Documenting Existing Provisioning, page 13-1](#)
- [13.3 Viewing Alarm Counts on the LCD for a Node, Slot, or Port, page 13-2](#)
- [13.4 Viewing Alarms, page 13-3](#)
- [13.5 Alarm Severities, page 13-10](#)
- [13.6 Alarm Profiles, page 13-10](#)
- [13.7 Suppressing Alarms, page 13-14](#)
- [13.8 Provisioning External Alarms and Controls, page 13-15](#)
- [13.9 Audit Trail, page 13-16](#)

### 13.1 Overview

CTC detects and reports SDH alarms generated by the Cisco ONS 15454 SDH and the larger SDH network. You can use CTC to monitor and manage alarms at the card, node, or network level. Default alarm severities conform to the ITU-T G.783 standard, but you can set alarm severities in customized alarm profiles or suppress CTC alarm reporting. For a detailed description of the standard ITU-T categories employed by Optical Networking System (ONS) nodes, refer to the *Cisco ONS 15454 SDH Troubleshooting Guide*.



**Note**

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ONS 15454 SDH alarms can also be monitored and managed through a network management system (NMS).

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### 13.2 Documenting Existing Provisioning

You can use the File > Print or File > Export options to print or export CTC provisioning information for record keeping or troubleshooting. The functions can be performed in card, node, or network views. The File > Print function sends the data to a local or network printer. File > Export exports the data to a file where it can be imported into other computer applications, such as spreadsheets and database management programs.

Whether you choose to print or export data, you can choose from the following options:

- Entire frame—Prints or exports the entire CTC window including the graphical view of the card, node, or network. This option is available for all windows.
- Tabbed view—Prints or exports the lower half of the CTC window containing tabs and data. The printout includes the selected tab (on top) and the data shown in the tab window. For example, if you print the History window tabbed view, you print only history items appearing in the window. This option is available for all windows.
- Table Contents—Prints CTC data in table format without graphical representations of shelves, cards, or tabs. This option applies to all windows except:
  - Provisioning > General > General and Power Monitor windows
  - Provisioning > Network > General and RIP windows
  - Provisioning > Security > Policy, Access, and Legal Disclaimer windows
  - Provisioning > SNMP window
  - Provisioning > Timing window
  - Provisioning > UCP > Node window
  - Provisioning > WDM-ANS > Provisioning window
  - Maintenance > Cross-Connect > Cards window
  - Maintenance > Database window
  - Maintenance > Diagnostic window
  - Maintenance > Protection window
  - Maintenance > Timing > Source window

The Table Contents option prints all the data contained in a table with the same column headings. For example, if you print the History window Table Contents view, you print all data included in the table whether or not items appear in the window.

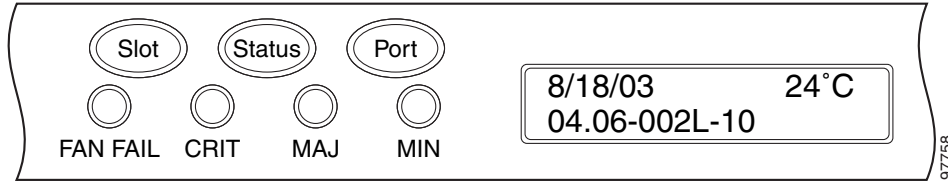
The above windows are not available for Export.

## 13.3 Viewing Alarm Counts on the LCD for a Node, Slot, or Port

You can view node, slot, or port-level alarm counts and summaries using the buttons on the ONS 15454 SDH LCD panel. The Slot and Port buttons toggle between display types; the Slot button toggles between node display and slot display, and the Port button toggles between slot and port views. Pressing the Status button after you choose the display mode changes the display from alarm count to alarm summary.

The ONS 15454 SDH has a one-button update for some commonly viewed alarm counts. If you press the Slot button once and then wait eight seconds, the display automatically changes from a slot alarm count to a slot alarm summary. If you press the Port button to toggle to port-level display, you can use the Port button to toggle to a specific slot and to view each port's port-level alarm count. [Figure 13-1](#) shows the LCD panel layout.

Figure 13-1 Shelf LCD Panel



## 13.4 Viewing Alarms

In the card-, node-, or network-level CTC view, click the Alarms tab to display the alarms for that card, node, or network. The Alarms window shows alarms in conformance with ITU-T G.783. This means that if a network problem causes two alarms, such as loss of frame (LOF) and loss of signal (LOS), CTC only shows the LOS alarm in this window because it supersedes the LOF and replaces it.

The Path Width column in the Alarms and Conditions tabs expands upon alarmed object information contained in the access identifier string (such as “VC4-6-1-6”) by giving the number of VC-4s contained in the alarmed path. For example, the Path Width will tell you whether a Critical alarm applies to a VC-4 (where the column will show 1) or a VC-12 (where the column will show 3). If the path contains a smaller circuit size than VC-4, the column is empty.

Table 13-1 lists the column headings and the information recorded in each column.

**Table 13-1** Alarms Column Descriptions

Column	Information Recorded
New	Indicates a new alarm. To change this status, click either the Synchronize button or the Delete Cleared Alarms button.
Date	Date and time of the alarm.
Node	Node where the alarm occurred (appears only in network view).
Object	The object for an HPmon or LPmon alarm or condition.
Eqpt Type	Card type in this slot.
Slot	Slot where the alarm occurred (appears only in network and node view).
Port	Port where the alarm is raised. For HPTerm and LPTerm, the port refers to the upstream card it is partnered with.
Path Width	Indicates how many VC-4s are contained in an alarmed path. (For any non-VC-4 object, such as a VC-3, the column is blank.) This information complements the alarm object notation, which is explained in Table 13-3.
Sev	Severity level: CR (Critical), MJ (Major), MN (Minor), NA (Not Alarmed), NR (Not Reported).
ST	Status: R (raised), C (clear).
SA	When checked, indicates a service-affecting alarm.
Cond	The error message/alarm name. These names are alphabetically defined in the “Alarm Troubleshooting” chapter of the <i>Cisco ONS 15454 SDH Troubleshooting Guide</i> .
Description	Description of the alarm.

**Table 13-1** Alarms Column Descriptions (continued)

Column	Information Recorded
Num	Num (number) is the quantity of alarm messages received, and is incremented automatically as alarms occur to display the current total of received error messages.
Ref	Ref (reference) is a unique identification number assigned to each alarm to reference a specific alarm message that is displayed.

Table 13-2 lists the color codes for alarm and condition severities. The inherited (I) and unset (U) severities are only listed in the network view Provisioning > Alarm Profiles tab. They are not currently implemented.

**Table 13-2** Color Codes for Alarm and Condition Severities

Color	Description
Red	Raised Critical (CR) alarm
Orange	Raised Major (MJ) alarm
Yellow	Raised Minor (MN) alarm
Magenta (pink)	Raised Not Alarmed (NA) condition
Blue	Raised Not Reported (NR) condition
White	Cleared (C) alarm or condition

**Note**

Major and Minor alarms may appear yellow in CTC under certain circumstances. This is not due to a CTC problem but to a workstation memory and color utilization problem. For example, a workstation might run out of colors if many color-intensive applications are running. When using Netscape, you can limit the number of colors used by launching it from the command line with either the `-install` option or the `-ncols 32` option.

In network view, CTC identifies STM and VC alarm objects based upon the object IDs. Table 13-3 lists the object numbering schemes for the MON (such as HPMon and LPMon) and TERM (such as HPTerm and LPTerm) objects.

**Table 13-3** Release 4.0 and Later Port-Based Alarm Numbering Scheme

STM and VC Alarm Numbering		
MON object	VC4-<slot>-<port>-<VC_within_port> For example, VC4-6-1-6	Port=1
TERM object	VC4-<slot>-<VC_within_slot> For example, VC4-6-6	Port=1

## 13.4.1 Viewing Alarms With Each Node's Time Zone

By default, alarms and conditions are displayed with the time stamp of the CTC workstation where you are viewing them. But you can set the node to report alarms (and conditions) using the time zone where the node is located by clicking Edit > Preferences, and clicking the Display Events Using Each Node's Timezone check box.

## 13.4.2 Controlling Alarm Display

You can control the display of the alarms shown on the Alarms window. [Table 13-4](#) shows the actions you can perform in the Alarms window.

**Table 13-4 Alarm Display**

Button/Check Box/Tool	Action
Filter button	Allows you to change the display on the Alarms window to show only alarms that meet a certain severity level, occur in a specified time frame, and/or reflect specific conditions. For example, you can set the filter so that only Critical alarms display on the window.  If you enable the Filter feature by clicking the Filter button in one CTC view, such as node view, it is enabled in the other views as well (card view and network view).
Synchronize button	Updates the alarm display. Although CTC displays alarms in real time, the Synchronize button allows you to verify the alarm display. This is particularly useful during provisioning or troubleshooting.
Delete Cleared Alarms button	Deletes alarms that have been cleared.
AutoDelete Cleared Alarms check box	If checked, CTC automatically deletes cleared alarms.
Filter tool	Enables or disables alarm filtering in the card, node, or network view. When enabled or disabled, this state applies to other views for that node and for all other nodes in the network. For example, if the Filter tool is enabled in the node (default login) view Alarms window, the network view Alarms window and card view Alarms window also have the tool enabled. All other nodes in the network also have the tool enabled.

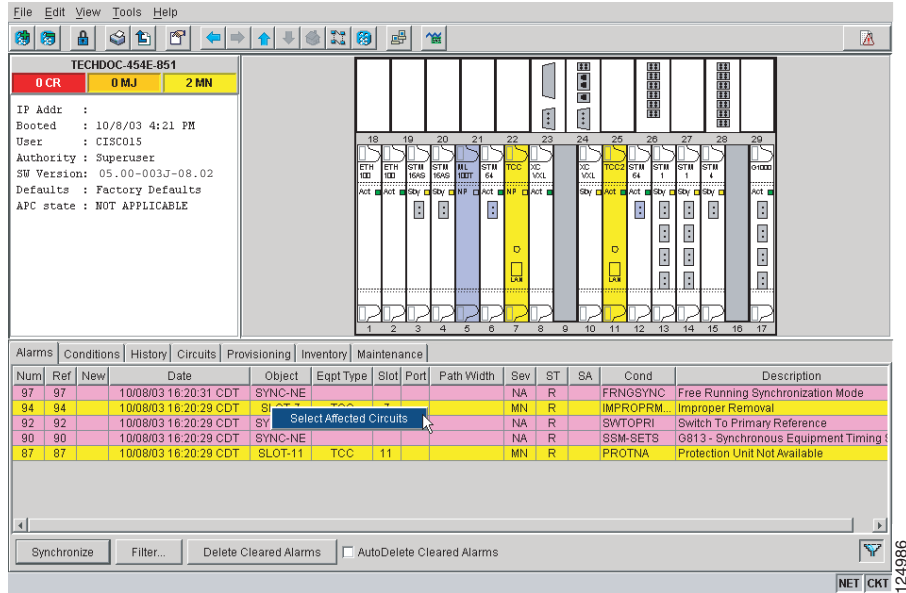
## 13.4.3 Filtering Alarms

The alarm display can be filtered to prevent display of alarms with certain severities or alarms that occurred between certain dates. You can set the filtering parameters by clicking the Filter button at the bottom-left of the Alarms window. You can turn the filter on or off by clicking the Filter tool at the bottom-right of the window. CTC retains your filter activation setting. For example, if you turn the filter on and then log out, CTC keeps the filter active the next time your user ID is activated.

## 13.4.4 Viewing Alarm-Affected Circuits

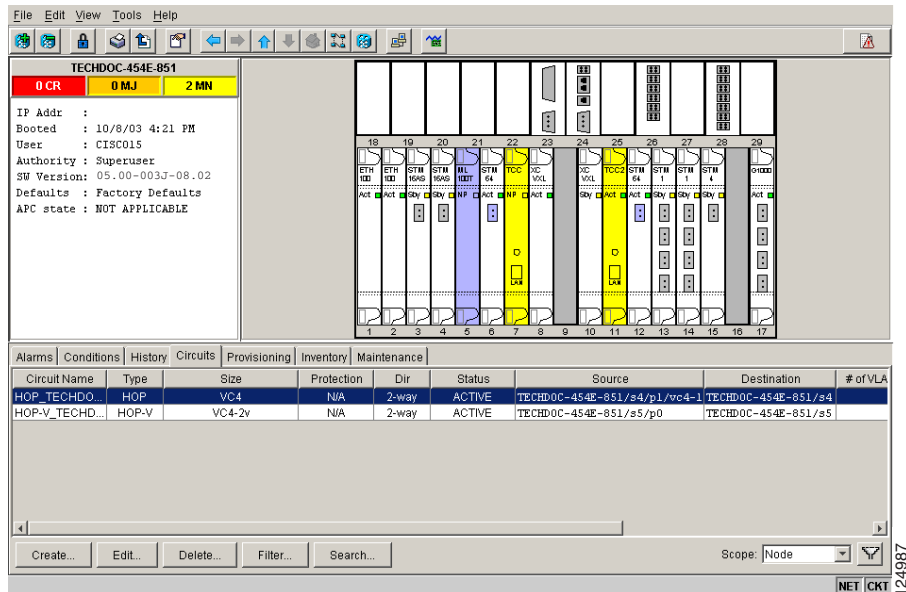
A user can view which ONS 15454 SDH circuits are affected by a specific alarm by positioning the cursor over the alarm in the Alarm window and right-clicking. A shortcut menu is displayed (Figure 13-2).

Figure 13-2 Select Affected Circuits Option



When the user selects the Select Affected Circuits option, the Circuits window opens to show the circuits that are affected by the alarm (Figure 13-3).

Figure 13-3 Viewing Alarm-Affected Circuits



## 13.4.5 Conditions Tab

The Conditions window displays retrieved fault conditions. A condition is a fault or status detected by ONS 15454 SDH hardware or software. When a condition occurs and continues for a minimum period, CTC raises a condition, which is a flag showing that this particular condition currently exists on the ONS 15454 SDH.

The Conditions window shows all conditions that occur, including those that are superseded. For instance, if a network problem causes two alarms, such as LOF and LOS, CTC shows both the LOF and LOS conditions in this window (even though LOS supersedes LOF). Having all conditions visible can be helpful when troubleshooting the ONS 15454 SDH. If you want to retrieve conditions that obey a root-cause hierarchy (that is, LOS supersedes and replaces LOF), you can exclude the same root causes by checking a check box in the window.

Fault conditions include reported alarms and Not Reported or Not Alarmed conditions. Refer to the trouble notifications information in the *Cisco ONS 15454 SDH Troubleshooting Guide* for more information about alarm and condition classifications.

## 13.4.6 Controlling the Conditions Display

You can control the display of the conditions on the Conditions window. [Table 13-5](#) shows the actions you can perform in the window.

**Table 13-5**      **Conditions Display**

Button	Action
Retrieve	Retrieves the current set of all existing fault conditions, as maintained by the alarm manager, from the ONS 15454 SDH.
Filter	Allows you to change the Conditions window display to only show the conditions that meet a certain severity level or occur in a specified time. For example, you can set the filter so that only Critical conditions display on the window.  <b>Note</b> There is a Filter button on the lower-right of the window that allows you to enable or disable the filter feature.
Exclude Same Root Cause	Retrieves conditions that obey a root-cause hierarchy (for example, LOS supersedes and replaces LOF).

### 13.4.6.1 Retrieving and Displaying Conditions

The current set of all existing conditions maintained by the alarm manager can be seen when you click the Retrieve button. The set of conditions retrieved is relative to the view. For example, if you click the button while displaying the node view, node-specific conditions are displayed. If you click the button while displaying the network view, all conditions for the network (including ONS 15454 SDH nodes and other connected nodes) are displayed, and the card view shows only card-specific conditions.

You can also set a node to display conditions using the time zone where the node is located, rather than the time zone of the PC where they are being viewed. See the [“13.4.1 Viewing Alarms With Each Node’s Time Zone”](#) section on page 13-5 for more information.

### 13.4.6.2 Conditions Column Descriptions

Table 13-6 lists the Conditions window column headings and the information recorded in each column.

**Table 13-6** Conditions Column Description

Column	Information Recorded
New	Indicates a new condition.
Date	Date and time of the condition.
Object	The object for an HPmon or LPmon.
Eqpt Type	Card type in this slot.
Slot	Slot where the condition occurred (appears only in network and node view).
Port	Port where the alarm is raised. For HPterm and LPterm, the port refers to the upstream card it is partnered with.
Sev <sup>1</sup>	Severity level: CR (Critical), MJ (Major), MN (Minor), NA (Not Alarmed), NR (Not Reported).
SA <sup>1</sup>	Indicates a service-affecting alarm (when checked).
Cond	The error message/alarm name; these names are alphabetically defined in the “Alarm Troubleshooting” chapter of the <i>Cisco ONS 15454 SDH Troubleshooting Guide</i> .
Description	Description of the condition.
Node	Node where the alarm occurred (appears only in network view).

1. All alarms, their severities, and service-affecting statuses are also displayed in the Condition tab unless you choose to filter the alarm from the display using the Filter button.

### 13.4.6.3 Filtering Conditions

The condition display can be filtered to prevent display of conditions (including alarms) with certain severities or that occurred between certain dates. You can set the filtering parameters by clicking the Filter button at the bottom-left of the Conditions window. You can turn the filter on or off by clicking the Filter tool at the bottom-right of the window. CTC retains your filter activation setting. For example, if you turn the filter on and then log out, CTC keeps the filter active the next time you log in.

## 13.4.7 Viewing History

The History window displays historic alarm or condition data for the node or for your login session. You can choose to display only alarm history, only events, or both by checking check boxes in the History > Node window. You can view network-level alarm and condition history, such as for circuits, at that level. At the node level, you can see all port (facility), card, STS, and system-level history entries. For example, protection-switching events or performance-monitoring threshold crossings appear here. If you double-click a card, you can view all port, card, and STS alarm or condition history that directly affects the card.

The ONS 15454 SDH can store up to 640 Critical alarm messages, 640 Major alarm messages, 640 Minor alarm messages, and 640 condition messages. When any of these limits is reached, the ONS 15454 SDH discards the oldest events in that category.



**Note**

In the Preference dialog General tab, the Maximum History Entries value only applies to the Session window.

Different views of CTC display the following kinds of history:

- The History > Session window is shown in network view, node view, and card view. It shows alarms and conditions that occurred during the current user CTC session.
- The History > Node window is only shown in node view. It shows the alarms and conditions that occurred on the node since CTC software was operated on the node.
- The History > Card window is only shown in card view. It shows the alarms and conditions that occurred on the card since CTC software was installed on the node.

**Tip**

Double-click an alarm in the History window to display the corresponding view. For example, double-clicking a card alarm takes you to card view. In network view, double-clicking a node alarm takes you to node view.

If you check the History window Alarms check box, you display the node history of alarms. If you check the Events check box, you display the node history of Not Alarmed and transient events (conditions). If you check both check boxes, you retrieve node history for both.

### 13.4.7.1 History Column Descriptions

Table 13-7 lists the History window column headings and the information recorded in each column.

**Table 13-7 History Column Description**

Column	Information Recorded
Num	An incrementing count of alarm or condition messages. (The column is hidden by default; to view it, right-click a column and choose Show Column > Num.)
Ref	The reference number assigned to the alarm or condition. (The column is hidden by default; to view it, right-click a column and choose Show Column > Ref.)
Date	Date and time of the condition.
Object	Identifier for the condition object. For an LPMon or HPMon, the object.
Sev	Severity level: Critical (CR), Major (MJ), Minor (MN), Not Alarmed (NA), Not Reported (NR).
Eqpt Type	Card type in this slot (only displays in network view and node view).
ST	Status: raised (R), cleared (C), or transient (T).
Description	Description of the condition.
Port	Port where the alarm is raised. For HPterm and LPterm, the port refers to the upstream card it is partnered with.
Cond	Condition name.
Slot	Slot where the condition occurred (only displays in network view and node view).
SA	Indicates a service-affecting alarm (when checked).

### 13.4.7.2 Retrieving and Displaying Alarm and Condition History

You can retrieve and view the history of alarms and conditions, as well as transients (passing notifications of processes as they occur) in the CTC history window. The information in this window is specific to the view where it is shown (that is, network history in the network view, node history in the node view, and card history in the card view).

The node and card history views are each divided into two tabs. In node view, when you click the Retrieve button, you can see the history of alarms, conditions, and transients that have occurred on the node in the History > Node window, and the history of alarms, conditions, and transients that have occurred on the node during your login session in the History > Session window. In the card-view history window, after you retrieve the card history, you can see the history of alarms, conditions, and transients on the card in the History > Card window, or a history of alarms, conditions, and transients that have occurred during your login session in the History > Session window. You can also filter the severities and occurrence period in these history windows.

## 13.5 Alarm Severities

ONS 15454 SDH alarm severities follow the ITU-T G.783 standard, so a condition might be Alarmed (at a severity of Critical [CR], Major [MJ], or Minor [MN]), Not Alarmed (NA) or Not Reported (NR). These severities are reported in the CTC software Alarms, Conditions, and History windows at all levels: network, shelf, and card.

ONS equipment provides a standard profile named Default listing all alarms and conditions with severity settings based on ITU-T G.783 and other standards, but users can create their own profiles with different settings for some or all conditions and apply these wherever desired. (See the “[13.6 Alarm Profiles](#)” section on page 13-10.) For example, in a custom alarm profile, the default severity of a carrier loss (CARLOSS) alarm on an Ethernet port could be changed from Major to Critical. The profile allows setting to Not Reported or Not Alarmed, as well as the three alarmed severities.

Critical and Major severities are only used for service-affecting alarms. If a condition is set as Critical or Major by profile, it will raise as Minor alarm in the following situations:

- In a protection group, if the alarm is on a standby entity (side not carrying traffic)
- If the alarmed entity has no traffic provisioned on it, so no service is lost

Because of this possibility of being raised at two different levels, the alarm profile pane shows Critical as CR / MN and Major as MJ / MN.

## 13.6 Alarm Profiles

The alarm profiles feature allows you to change default alarm severities by creating unique alarm profiles for individual ONS 15454 SDH ports, cards, or nodes. A created alarm profile can be applied to any node on the network. Alarm profiles can be saved to a file and imported elsewhere in the network, but the profile must be stored locally on a node before it can be applied to the node, its cards, or its cards' ports.

CTC can store up to ten active alarm profiles at any time to apply to the node. Custom profiles can take eight of these active profile positions. Two other profiles, Default profile and Inherited profile, are reserved by the NE, and cannot be edited. The reserved Default profile contains ITU-T G.783 severities. The reserved Inherited profile allows port alarm severities to be governed by the card-level severities, or card alarm severities to be determined by the node-level severities.

If one or more alarm profiles have been stored as files from elsewhere in the network onto the local PC or server hard drive where CTC resides, you can utilize as many profiles as you can physically store by deleting and replacing them locally in CTC so that only eight are active at any given time.

## 13.6.1 Creating and Modifying Alarm Profiles

Alarm profiles are created in the network view using the Provisioning > Alarm Profiles tabs. A default alarm profile following ITU-T G.783 is preprovisioned for every alarm. After loading the default profile or another profile on the node, you can use the Clone feature to create custom profiles. After the new profile is created, the Alarm Profiles window shows the original profile—frequently Default—and the new profile.

**Note**

The alarm profile list contains a master list of alarms that is used for a mixed node network. Some of these alarms might not be used in all ONS nodes.

**Note**

The Default alarm profile list contains alarm and condition severities that correspond when applicable to default values established in ITU-T G.783.

**Note**

All default or user-defined severity settings that are Critical (CR) or Major (MJ) are demoted to Minor (MN) in non-service-affecting situations.

**Tip**

To see the full list of profiles including those available for loading or cloning, click the Available button. You must load a profile before you can clone it.

**Note**

Up to ten profiles, including the two reserved profiles—Inherited and Default—can be stored in CTC.

Wherever it is applied, the Default alarm profile sets severities to standard ITU-T G.783 settings. The Inherited profile sets alarm severity to inherited (I) so that alarms inherit, or copy, severities from the next-highest level. For example, a card with an Inherited alarm profile copies the severities used by the node housing the card. If you choose the Inherited profile from the network view, the severities at the lower levels (node and card) be copied from this selection.

You do not have to apply a single severity profile to the node-, card-, and port-level alarms. Different profiles can be applied at different levels. You could use the inherited or default profile on a node and on all cards and ports, but apply a custom profile that downgrades an alarm on one particular card. For example, you might choose to downgrade an STM-N unequipped path alarm (HP-UNEQ) from Critical (CR) to Not Alarmed (NA) on an optical card because this alarm raises and then clears every time you create a circuit. HP-UNEQ alarms for the card with the custom profile would not display on the Alarms tab. (But they would still be recorded in the Conditions and History tabs.)

When you modify severities in an alarm profile, the following rules apply:

- All Critical (CR) or Major (MJ) default or user-defined severity settings are demoted to Minor (MN) in Non-Service-Affecting (NSA) situations.
- Default severities are used for all alarms and conditions until you create a new profile and apply it.

## 13.6.2 Alarm Profile Buttons

The Alarm Profiles window displays six buttons at the bottom. [Table 13-8](#) lists and describes each of the alarm profile buttons and their functions.

**Table 13-8 Alarm Profile Buttons**

Button	Description
New	Adds a new alarm profile.
Load	Loads a profile to a node or a file.
Store	Saves profiles on a node (or nodes) or in a file.
Delete	Deletes profiles from a node.
Compare	Displays differences between alarm profiles (for example, individual alarms that are not configured equivalently between profiles).
Available	Displays all profiles available on each node.
Usage	Displays all entities (nodes and alarm subjects) present in the network and which profiles contain the alarm. Can be printed.

## 13.6.3 Alarm Profile Editing

[Table 13-9](#) lists and describes the five profile-editing options available when you right-click an alarm item in the profile column (such as Default).

**Table 13-9 Alarm Profile Editing Options**

Button	Description
Store	Saves a profile in a node or in a file.
Rename	Changes a profile name.
Clone	Creates a profile that contains the same alarm severity settings as the profile being cloned.
Reset	Restores a profile to its previous state or to the original state (if it has not yet been applied).
Remove	Removes a profile from the table editor.

## 13.6.4 Alarm Severity Options

To change or assign alarm severity, left-click the alarm severity you want to change in the alarm profile column. Seven severity levels appear for the alarm:

- Not Reported (NR)
- Not Alarmed (NA)
- Minor (MN)
- Major (MJ)
- Critical (CR)

- Use Default
- Transient (T)

Transient and Use Default severity alarms only appear in alarm profiles. They do not appear when you view alarms, history, or conditions.

## 13.6.5 Row Display Options

In the network view, the Alarm Profiles window displays the following check boxes at the bottom of the window:

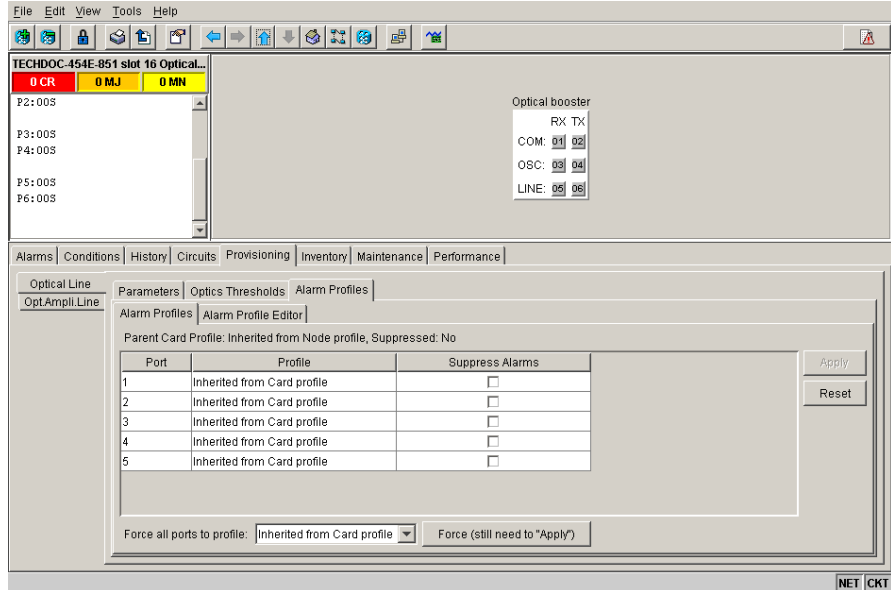
- Only show service-affecting severities—If unchecked, the editor shows severities in the format <sev1>/<sev2> where <sev1> is a service-affecting severity and <sev2> is not service-affecting. If checked, the editor only shows <sev1> alarms.
- Hide reference values—Highlights alarms with nondefault severities by clearing alarm cells with default severities.
- Hide identical rows—Hides rows of alarms that contain the same severity for each profile.

## 13.6.6 Applying Alarm Profiles

In CTC node view, the Alarm Behavior window displays alarm profiles for the node. In card view, the Alarm Behavior window displays the alarm profiles for the selected card. Alarm profiles form a hierarchy. A node-level alarm profile applies to all cards in the node except cards that have their own profiles. A card-level alarm profile applies to all ports on the card except ports that have their own profiles.

At the node level, you can apply profile changes on a card-by-card basis or set a profile for the entire node. At the card-level view, you can apply profile changes on a port-by-port basis or set alarm profiles for all ports on that card. [Figure 13-4](#) shows the OPT-BST card view of an alarm profile.

Figure 13-4 Card View Port Alarm Profile for an OPT-BST Card



## 13.7 Suppressing Alarms

ONS 15454 SDH nodes have an alarm suppression option that clears raised alarm messages for the node, chassis, one or more slots (cards), or one or more ports. After they are cleared, these alarms change appearance from their normal severity color to white and they can be cleared from the display by clicking Synchronize. Alarm suppression itself raises an alarm called AS-CMD that is shown in applicable Alarms windows. Node-level suppression is shown in the node view Alarms window, and card or port-level suppression is shown in all views. The AS-CMD alarm itself is not cleared by the suppress command. Each instance of this alarm indicates its object separately in the Object column.

A suppression command applied at a higher level does not supersede a command applied at a lower level. For example, applying a node-level alarm suppression command makes all raised alarms for the node appear to be cleared, but it does not cancel card-level or port-level suppression. Each of these conditions can exist independently and must be cleared independently.

Suppression causes the entity alarm to behave like a Not Reported event. This means that the alarms, having been suppressed from view in the Alarms window, are now only shown in the Conditions window. The suppressed alarms are displayed with their usual visual characteristics (service-affecting status and color-coding) in the window. The alarms still appear in the History window.



### Note

Use alarm suppression with caution. If multiple CTC sessions are open, suppressing the alarms in one session suppresses the alarms in all other open sessions.

## 13.8 Provisioning External Alarms and Controls

External alarm inputs can be provisioned on the Alarm Interface Controller-International (AIC-I) card for external sensors such as an open door and flood sensors, temperature sensors, and other environmental conditions. External control outputs on this card allow you to drive external visual or audible devices such as bells and lights. They can control other devices such as generators, heaters, and fans.

You provision external alarms in the AIC-I card view Provisioning > Card > External Alarms tab. Provision controls in the AIC-I card view Provisioning > Card > External Controls tab. Up to 16 external alarm inputs and 4 external controls are available with the AIC-I card.

### 13.8.1 External Alarm Input

You can provision each alarm input separately. Provisionable characteristics of external alarm inputs include:

- Alarm type, from a list of possibilities in a drop-down list
- Alarm severity (CR, MJ, MN, NA, and NR)
- Alarm-trigger setting (open or closed): Open means that the normal condition is no current flowing through the contact, and the alarm is generated when current does flow; closed means that normal condition is to have current flowing through the contact, and the alarm is generated with current stops flowing.
- Virtual wire associated with the alarm
- CTC alarm log description (up to 63 characters)



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**Note** If you provision an external alarm to raise upon an open contact before you physically connect to the ONS equipment, the alarm will raise until you do create the physical connection.

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**Note** When you provision an external alarm, the alarm object is ENV-IN-*nn*. The variable *nn* refers to the external alarm's number, regardless of the name you assign.

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### 13.8.2 External Control Output

You can provision each alarm output separately. Provisionable characteristics of alarm outputs include:

- Control type
- Trigger type (alarm or virtual wire)
- Description for CTC display
- Closure setting (manually or by trigger). If you provision the output closure to be triggered, the following characteristics can be used as triggers:
  - Local NE alarm severity—A chosen alarm severity (for example, Major) and any higher-severity alarm (in this case, Critical) causes output closure.
  - Remote NE alarm severity—Similar to local NE alarm severity trigger setting, but applies to remote alarms.

- Virtual wire entities—You can provision an alarm that is input to a virtual wire to trigger an external control output.

## 13.9 Audit Trail

The ONS 15454 SDH maintains an audit trail log that resides on the TCC2/TCC2P. This record shows who has accessed the system and what operations were performed during a given time period. The log includes authorized Cisco logins and logouts using the operating system command line interface, Cisco Transport Controller (CTC), and TL1; the log also includes FTP actions, circuit creation/deletion, and user/system generated actions.

Event monitoring is also recorded in the audit log. An event is defined as the change in status of an element within the network. External events, internal events, attribute changes, and software upload/download activities are recorded in the audit trail.

Audit trails are useful for maintaining security, recovering lost transactions and enforcing accountability. Accountability is the ability to trace user activities by associating a process or action with a specific user. To view the audit trail log, refer to the *Cisco ONS 15454 SDH Procedure Guide*. to view the audit trail record. Any management interface (CTC, CTM, TL1) can access the audit trail logs.

The audit trail is stored in persistent memory and is not corrupted by processor switches, resets or upgrades. However, if the TCC2/TCC2Ps are removed, the audit trail log is lost.

### 13.9.1 Audit Trail Log Entries

Audit trail records capture the following activities:

- User—Name of the user performing the action
- Host—Host from where the activity is logged
- Device ID—IP address of the device involved in the activity
- Application—Name of the application involved in the activity
- Task—Name of the task involved in the activity (View a dialog, apply configuration and so on)
- Connection Mode—Telnet, Console, SNMP
- Category—Type of change; Hardware, Software, Configuration
- Status—Status of the user action (Read, Initial, Successful, Timeout, Failed)
- Time—Time of change
- Message Type—Denotes if the event is Success/Failure type
- Message Details—A description of the change

### 13.9.2 Audit Trail Capacities

The system is able to store 640 log entries. When this limit is reached, the oldest entries are overwritten with new events.

When the log server is 80 percent full, an AUD-LOG-LOW condition is raised and logged (by way of CORBA/CTC).



When the log server reaches a maximum capacity of 640 entries and begins overwriting records that were not archived, an AUD-LOG-LOSS condition is raised and logged. This event indicates that audit trail records have been lost. Until the user off-loads the file, this event occurs once regardless of the amount of entries that are overwritten by the system. To export the audit trail log, refer to the *Cisco ONS 15454 SDH Procedure Guide*.



## Ethernet Operation

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The Cisco ONS 15454 SDH integrates Ethernet into an SDH time-division multiplexing (TDM) platform. The ONS 15454 SDH supports E-Series, G-Series, and ML-Series Ethernet cards. This chapter covers the operation of the E-Series and G-Series Ethernet cards. For information on the ML-Series cards, refer to the *Cisco ONS 15454 SONET/SDH ML-Series Multilayer Ethernet Card Software Feature and Configuration Guide*. For Ethernet card specifications, see [Chapter 5, “Ethernet Cards.”](#) For Ethernet circuit procedures, refer to the “Create Circuits and Low-Order Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

Chapter topics include:

- [14.1 G-Series Application, page 14-1](#)
- [14.2 G-Series Gigabit Ethernet Transponder Mode, page 14-5](#)
- [14.3 E-Series Application, page 14-10](#)
- [14.4 G-Series Circuit Configurations, page 14-19](#)
- [14.5 E-Series Circuit Configurations, page 14-20](#)
- [14.6 Remote Monitoring Specification Alarm Thresholds, page 14-23](#)

### 14.1 G-Series Application

The G-Series cards (G1000-4/G1K-4) reliably transport Ethernet and IP data across an SDH backbone. The G-Series cards map up to four Gigabit Ethernet interfaces onto an SDH transport network and provide scalable and provisionable transport bandwidth at signal levels up to VC4-16C per card. The G-Series cards provide line rate forwarding for all Ethernet frames (unicast, multicast, and broadcast) and can be configured to support Jumbo frames (defined as a maximum of 10,000 bytes). The G-Series cards incorporate features optimized for carrier-class applications such as:

- High Availability (including hitless [ $< 50$  ms] performance under software upgrades and all types of SONET/SDH equipment protection switches)
- Hitless reprovisioning
- Support of Gigabit Ethernet traffic at full line rate
- Serviceability options including enhanced port states, terminal and facility loopback, and J1 path trace
- SDH-style alarm support
- Ethernet performance monitoring (PM) and remote monitoring (RMON) functions

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The G-Series cards allow an Ethernet private line service to be provisioned and managed very much like a traditional SDH or SONET line. G-Series card applications include providing carrier-grade transparent LAN services (TLS), 100 Mbps Ethernet private line services (when combined with an external 100-Mb Ethernet switch with Gigabit uplinks), and high-availability transport.

The card maps a single Ethernet port to a single STM circuit. You can independently map the four ports on the G-Series card to any combination of VC4, VC4-2c, VC4-3c, VC4-4c, VC4-8c, and VC4-16C circuit sizes, provided the sum of the circuit sizes that terminate on a card do not exceed VC4-16C.

To support a Gigabit Ethernet port at full line rate, an STM circuit with a capacity greater or equal to 1 Gbps (bidirectional 2 Gbps) is needed. A VC4-8c is the minimum circuit size that can support a Gigabit Ethernet port at full line rate. The G-Series card supports a maximum of two ports at full line rate.

The G-Series transmits and monitors the SDH J1 Path Trace byte in the same manner as ONS 15454 SDH STM-N cards. For more information, see the “10.9 Path Trace” section on page 10-15.



### Note

G-Series encapsulation is standard high-level data link control (HDLC) framing over SONET/SDH as described in RFC 1622 and RFC 2615 with the point-to-point protocol (PPP) field set to the value specified in RFC 1841.

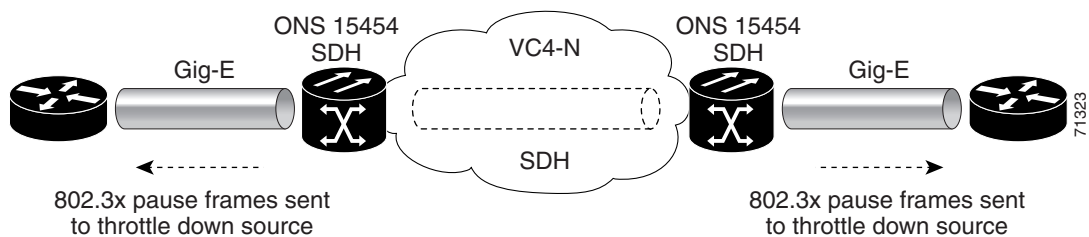
## 14.1.1 G1K-4 and G1000-4 Comparison

The G1K-4 and the G1000-4 cards constitute the ONS 15454 SDH G-Series and are hardware equivalents. Software releases prior to R4.0 identify both the G1000-4 and the G1K-4 as G1000-4 cards when they are physically installed. Software R4.0 and later identify G1K-4 cards correctly (that is, as G1K-4 cards) when they are physically installed.

## 14.1.2 G-Series Example

Figure 14-1 shows an example of a G-Series application. In this example, data traffic from the Gigabit Ethernet port of a high-end router travels across the ONS 15454 SDH point-to-point circuit to the Gigabit Ethernet port of another high-end router.

**Figure 14-1** Data Traffic on a G-Series Point-to-Point Circuit



The G-Series card carries any Layer 3 protocol that can be encapsulated and transported over Gigabit Ethernet, such as IP or IPX. The data is transmitted on the Gigabit Ethernet fiber into a standard Gigabit Interface Converter (GBIC) on a G-Series card. The G-Series card transparently maps Ethernet frames into the SDH payload by multiplexing the payload onto an SDH STM-N card. When the SDH payload reaches the destination node, the process is reversed and the data is transmitted from the standard Cisco GBIC in the destination G-Series card onto the Gigabit Ethernet fiber.

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The G-Series card discards certain types of erroneous Ethernet frames rather than transport them over SDH. Erroneous Ethernet frames include corrupted frames with cyclic redundancy checking (CRC) errors and under-sized frames that do not conform to the minimum 64-byte length Ethernet standard. The G-Series card forwards valid frames unmodified over the SDH network. Information in the headers is not affected by the encapsulation and transport. For example, packets with formats that include IEEE 802.1Q information will travel through the process unaffected.

### 14.1.3 IEEE 802.3z Flow Control and Frame Buffering

The G-Series supports IEEE 802.3z flow control and frame buffering to reduce data traffic congestion. To prevent over-subscription, 512 KB of buffer memory is available for the receive and transmit channels on each port. When the buffer memory on the Ethernet port nears capacity, the ONS 15454 SDH uses IEEE 802.3z flow control to transmit a pause frame to the source at the opposite end of the Gigabit Ethernet connection.

The pause frame instructs the source to stop sending packets for a specific period of time. The sending station waits the requested time before sending more data. [Figure 14-1 on page 14-2](#) illustrates pause frames being sent and received by ONS 15454 SDHs and attached switches.

The G-Series card proposes symmetric flow control when auto negotiating flow control with attached Ethernet devices. Symmetric flow control allows the G-Series to respond to pause frames sent from external devices and to send pause frames to external devices. Prior to Software R4.0, flow control on the G-Series card was asymmetric, meaning the card sent pause frames and discarded received pause frames.

This flow-control mechanism matches the sending and receiving device throughput to that of the bandwidth of the STM circuit. For example, a router might transmit to the Gigabit Ethernet port on the G-Series card. This particular data rate may occasionally exceed 622 Mbps, but the ONS 15454 SDH circuit assigned to the G-Series port might be only VC4-4c (622.08 Mbps). In this example, the ONS 15454 SDH sends out a pause frame and requests that the router delay its transmission for a certain period of time. With flow control and a substantial per-port buffering capability, a private line service provisioned at less than full line rate capacity (VC4-8c) is efficient because frame loss can be controlled to a large extent.

The G-Series has flow control threshold provisioning, which allows a user to select one of three watermark (buffer size) settings: default, low latency or custom. Default is the best setting for general use and was the only setting available prior to Software R4.1. Low latency is good for sub-rate applications, such as VoIP. For attached devices with insufficient buffering, best effort traffic or long access line lengths, set the G-Series card to a higher latency.

The custom setting allows you to specify an exact buffer size threshold for Flow Ctrl Lo and Flow Ctrl Hi. The flow control high setting is the watermark for sending the “Pause On” frame to the attached Ethernet device; this frame signals the device to temporarily stop transmitting. The flow control low setting is the watermark for sending the “Pause Off” frame, which signals the device to resume transmitting.

**Note**

External Ethernet devices with auto-negotiation configured to interoperate with G-Series cards running releases prior to R4.0 do not need to change auto-negotiation settings when interoperating with G-Series cards running R4.0 and later.

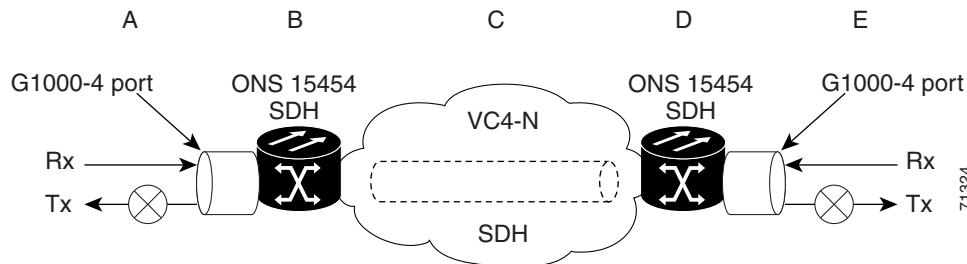
**Note**

With a G-Series card, you can only enable flow control on a port if auto negotiation is enabled on the device attached to that port.

**REVIEW DRAFT – CISCO CONFIDENTIAL****14.1.4 Ethernet Link Integrity Support**

The G-Series supports end-to-end Ethernet link integrity (Figure 14-2). This capability is integral to providing an Ethernet private line service and correct operation of Layer 2 and Layer 3 protocols on the attached Ethernet devices. End-to-end Ethernet link integrity essentially means that if any part of the end-to-end path fails, the entire path fails. Failure of the entire path is ensured by turning off the transmit lasers at each end of the path. The attached Ethernet devices recognize the disabled transmit laser as a loss of carrier and consequently as an inactive link.

**Figure 14-2 End-to-End Ethernet Link Integrity Support**

**Note**

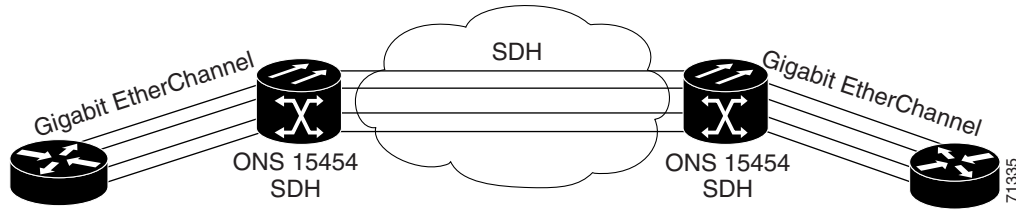
Some network devices can be configured to ignore a loss-of-carrier condition. If a device configured to ignore a loss-of-carrier condition attaches to a G-Series card at one end, alternative techniques (such as use of Layer 2 or Layer 3 keep-alive messages) are required to route traffic around failures. The response time of such alternate techniques is typically much longer than techniques that use link state as indications of an error condition.

As shown in Figure 14-2, a failure at any point of the path causes the G-Series card at each end to disable its Tx transmit laser, which causes the devices at both ends to detect a link down. If one of the Ethernet ports is administratively disabled or set in loopback mode, the port is considered a “failure” for the purposes of end-to-end link integrity because the end-to-end Ethernet path is unavailable. The port “failure” also disables both ends of the path.

**14.1.5 Gigabit EtherChannel/IEEE 802.3ad Link Aggregation**

The end-to-end Ethernet link integrity feature can be used in combination with Gigabit EtherChannel capability on attached devices. The combination provides an Ethernet traffic restoration scheme that has a faster response time than alternate techniques such as spanning tree rerouting, yet is more bandwidth efficient because spare bandwidth does not need to be reserved.

The G-Series supports all forms of link aggregation technologies including Gigabit EtherChannel (GEC), which is a Cisco proprietary standard, and the IEEE 802.3ad standard. The end-to-end link integrity feature of the G-Series allows a circuit to emulate an Ethernet link. This allows all types of Layer 2 and Layer 3 rerouting to work correctly with the G-Series. Figure 14-3 illustrates G-Series GEC support.

**REVIEW DRAFT—CISCO CONFIDENTIAL****Figure 14-3 G-Series Gigabit EtherChannel (GEC) Support**

Although the G-Series card does not actively run GEC, it supports the end-to-end GEC functionality of attached Ethernet devices. If two Ethernet devices running GEC connect through G-Series cards to an ONS 15454 SDH network, the ONS 15454 SDH side network is transparent to the EtherChannel devices. The EtherChannel devices operate as if they are directly connected to each other. Any combination of G-Series parallel circuit sizes can be used to support GEC throughput.

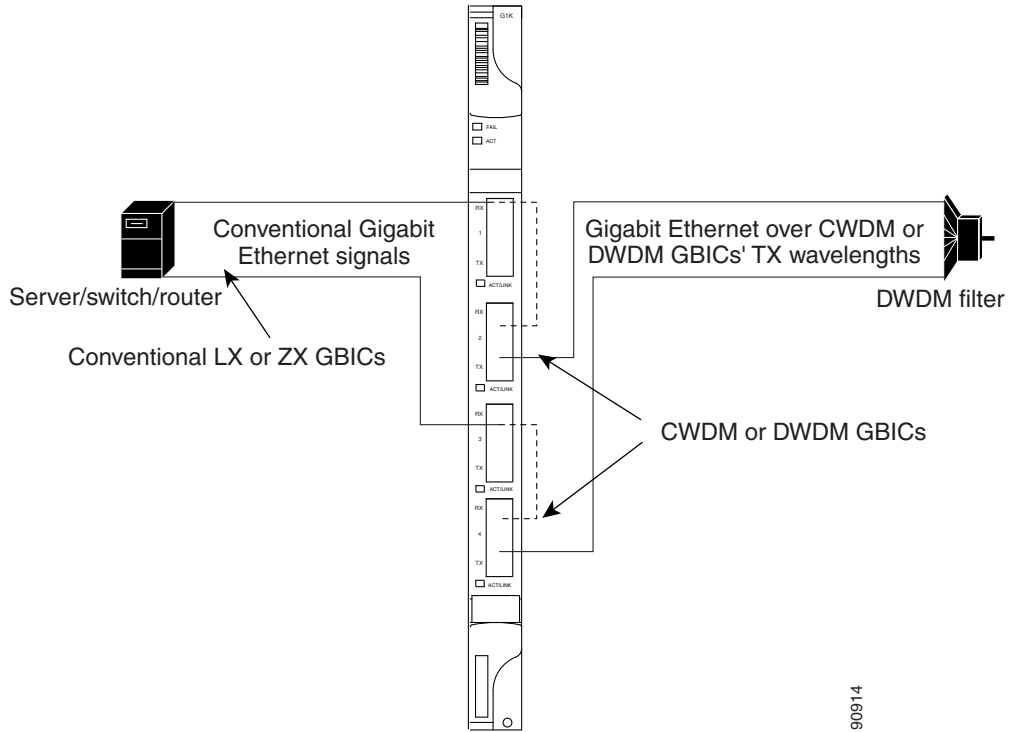
GEC provides line-level active redundancy and protection (1:1) for attached Ethernet equipment. It can also bundle parallel G-Series data links together to provide more aggregated bandwidth. STP operates as if the bundled links are one link and permits GEC to utilize these multiple parallel paths. Without GEC, STP permits only a single non blocked path. GEC can also provide G-Series card-level protection or redundancy because it can support a group of ports on different cards (or different nodes) so that if one port or card has a failure, traffic is rerouted over the other port or card.

## 14.2 G-Series Gigabit Ethernet Transponder Mode

The G-Series card can be configured as a transponder. Transponder mode can be used with any G-Series supported GBIC (SX, LX, ZX, coarse wavelength division multiplexing [CWDM], or dense wavelength division multiplexing [DWDM]). [Figure 14-4](#) shows a card-level overview of a transponder mode application.

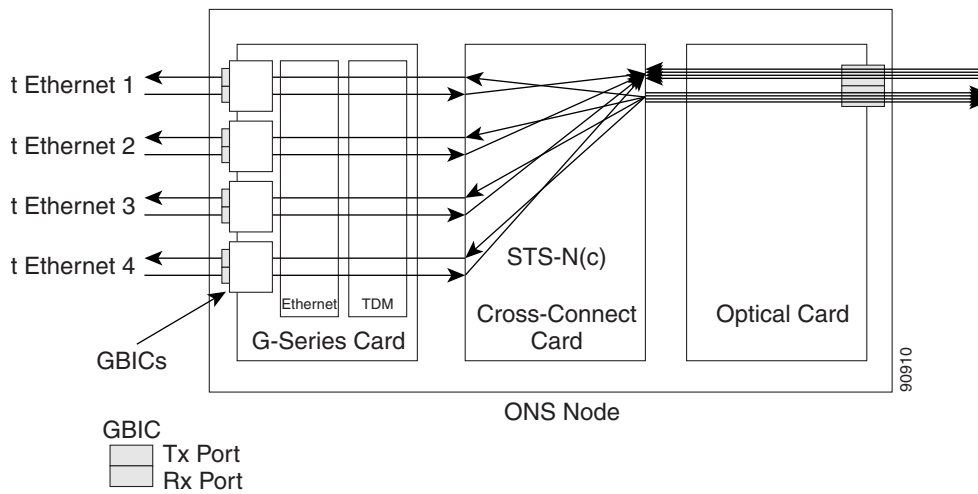
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**Figure 14-4 Card Level Overview of G-Series One Port Transponder Mode Application**



A G-Series card configured as a transponder operates quite differently than a G-Series card configured for SDH. In an SDH configuration, the G-Series card receives and transmits Gigabit Ethernet traffic from the Ethernet ports and GBICs on the front of the card. This Ethernet traffic is multiplexed on and off the SDH network through the cross-connect card and the OC-N card (Figure 14-5).

**Figure 14-5 G-Series in Default SDH Mode**

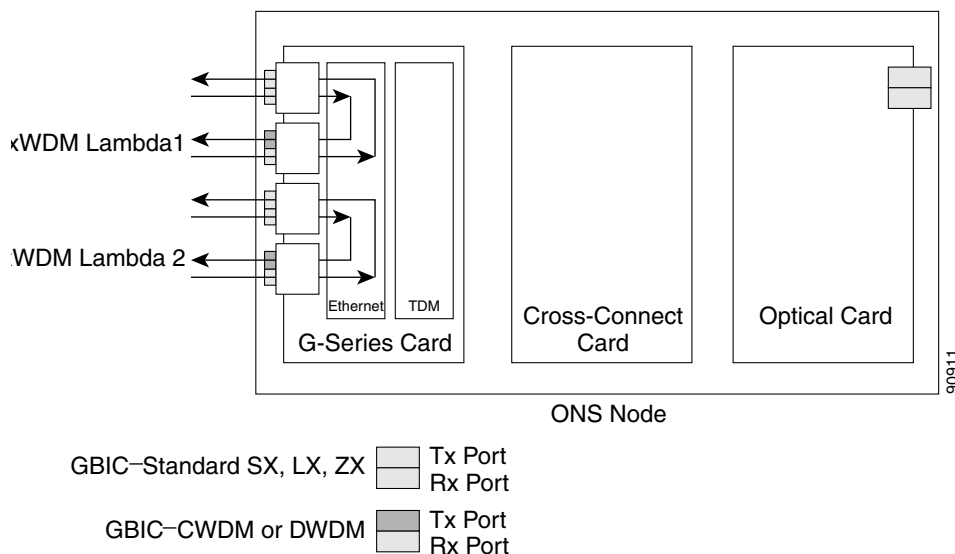




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In transponder mode, the G-Series Ethernet traffic never comes into contact with the cross-connect card or the SDH network, but stays internal to the G-Series card and is routed back to a GBIC on that card (Figure 14-6).

**Figure 14-6 G-Series Card in Transponder Mode (Two-Port Bidirectional)**



A G-Series card can either be configured for transponding mode or as the SDH default. Once any port is provisioned in transponding mode, the card is in transponding mode and no SDH circuits can be configured until every port on the card goes back to SDH mode. Refer to the *Cisco ONS 15454 SDH Procedure Guide* for instructions on how to provision G-Series ports for transponder mode.

All SDH circuits must be deleted before a G-Series card can be configured in transponding mode. An ONS 15454 SDH can host the card in any of the twelve traffic slots on the ONS 15454 SDH and supports a maximum of 24 bidirectional or 48 unidirectional lambdas.

A G-Series card configured as a transponder can be in one of three modes:

- Two-port bidirectional transponding mode
- One-port bidirectional transponding mode
- Two-port unidirectional transponding mode

## 14.2.1 Two-Port Bidirectional Transponder

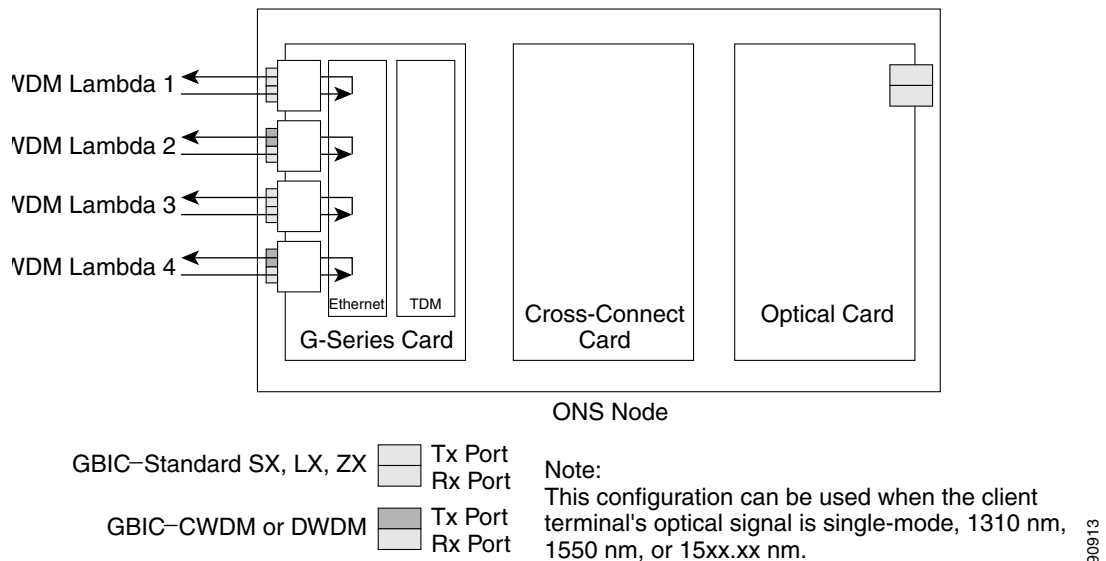
Two-port bidirectional transponder mode maps the transmitted and received Ethernet frames of one G-Series card port into the transmit and receive of another port (Figure 14-6). Transponder bidirectional port mapping can be between any two ports on the same card.

**REVIEW DRAFT – CISCO CONFIDENTIAL****14.2.2 One-Port Bidirectional Transponder**

One-port bidirectional transponder mode maps the Ethernet frames received at a port out the transmitter of the same port (Figure 14-7). This mode is similar to two-port bidirectional transponder mode except that a port is mapped only to itself instead of to another port. Although the data path of the one port bidirectional transponder mode is identical to that of a facility loopback, the transponding mode is not a maintenance mode and does not suppress non-SDH alarms, such as loss of carrier (CARLOSS).

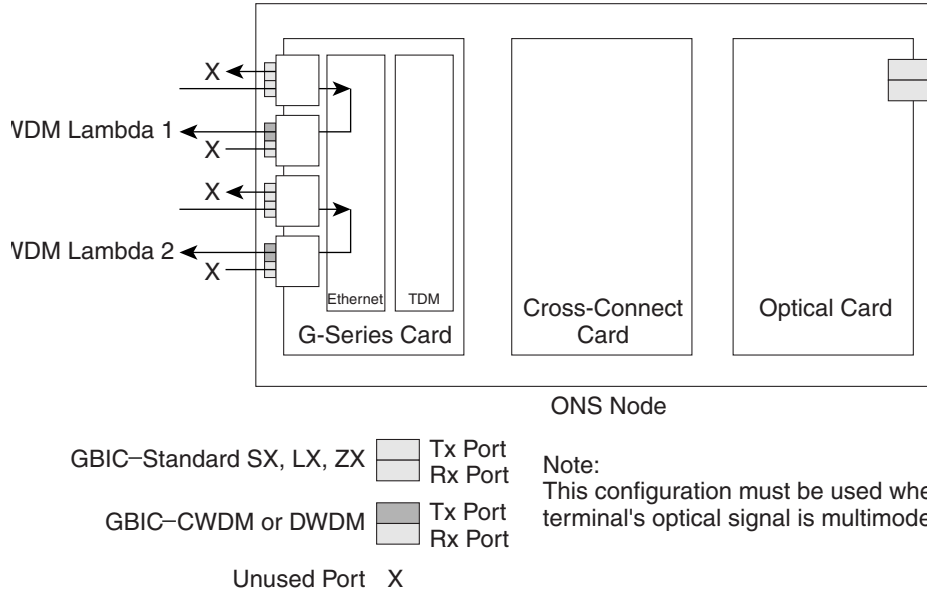
This mode can be used for intermediate DWDM signal regeneration and to take advantage of the wide band capability of the CWDM and DWDM GBICs, which allows the node to receive on multiple wavelengths but transmit on a fixed wavelength.

**Figure 14-7 One-Port Bidirectional Transponding Mode**

**14.2.3 Two-Port Unidirectional Transponder**

Ethernet frames received at one port's receiver will be transmitted out the transmitter of another port. This mode is similar to two-port bidirectional transponder mode except only one direction is used (Figure 14-8). One port must be provisioned as unidirectional transmit only and the other port must be provisioned as unidirectional receive. The port configured as unidirectional transmit ignores any missing signals on the receive port, so the receive port fiber does not need to be connected. The port configured as unidirectional receive does not turn on the transmit laser so the transmit port fiber does not need to be connected.

This mode can be used when only one direction needs to be transmitted over CWDM/DWDM, for example certain video-on-demand (VoD) applications.

**REVIEW DRAFT—CISCO CONFIDENTIAL****Figure 14-8 Two-Port Unidirectional Transponder**

## 14.2.4 G-Series Transponder Mode Characteristics

The operation of a G-Series card in transponder mode differs from a G-Series card in SDH mode in several ways:

- A G-Series card set to transponder mode will not show up in the CTC list of provisionable cards when the user is provisioning an SDH circuit.
- G-Series cards set to transponder mode do not require cross-connect cards (for example, the XC10G), but do require TCC2 cards.
- G-Series ports configured as transponders do not respond to flow control pause frames and pass the pause frames transparently through the card. In SDH mode, ports can respond to pause frames and do not pass the pause frames through the card.
- All SDH-related alarms are suppressed when a card is set in transponding mode.
- There are no slot number or cross-connect restrictions for G1000-4 or G1K-4 cards in transponder mode.
- Facility and terminal loopbacks are not fully supported in unidirectional transponding mode but are supported in both bidirectional transponding modes.
- Ethernet autonegotiation is not supported and cannot be provisioned in unidirectional transponding mode. Autonegotiation is supported in both bidirectional transponding modes.
- No end-to-end link integrity function is available in transponding mode.

**Note**

In normal SDH mode the G-Series cards support an end-to-end link integrity function. This function causes an Ethernet or SDH failure to disable and turn the transmitting laser off the corresponding mapped Ethernet port. In transponder mode, the loss of signal on an Ethernet port has no impact on the transmit signal of the corresponding mapped port.

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The operation of a G-Series card in transponder mode is also similar to the operation of a G-Series card in SDH mode:

- G-Series Ethernet statistics are available for ports in both modes.
- Ethernet port level alarms and conditions are available for ports in both modes.
- Jumbo frame and non-jumbo frame operation is the same in both modes.
- Collection, reporting and threshold crossing conditions for all existing counters and performance monitoring (PM) parameters are the same in both modes.
- SNMP and RMON support is the same in both modes.

## 14.3 E-Series Application

The E-Series cards incorporate Layer 2 switching, whereas the G-Series card is a straight mapper card. E-Series cards in multcard Etherswitch Group or single-card EtherSwitch support virtual local area networks (VLANs), IEEE 802.1Q, STP, and IEEE 802.1D. The E-Series card in port-mapped mode configures the E-Series card to be a mapper card and disables the Layer 2 functions. An ONS 15454 SDH holds a maximum of ten Ethernet cards, and you can insert Ethernet cards in any multipurpose slot.

### 14.3.1 E-Series Modes

An E-Series card operates in one of three modes: Multicard EtherSwitch Group, Single-card EtherSwitch, or Port-mapped. Within an ONS 15454 SDH containing multiple E-Series cards, each E-Series card can operate in any of the three separate modes. At the Ethernet card view in CTC, click the **Provisioning > Ether Card** tabs to reveal the card modes.

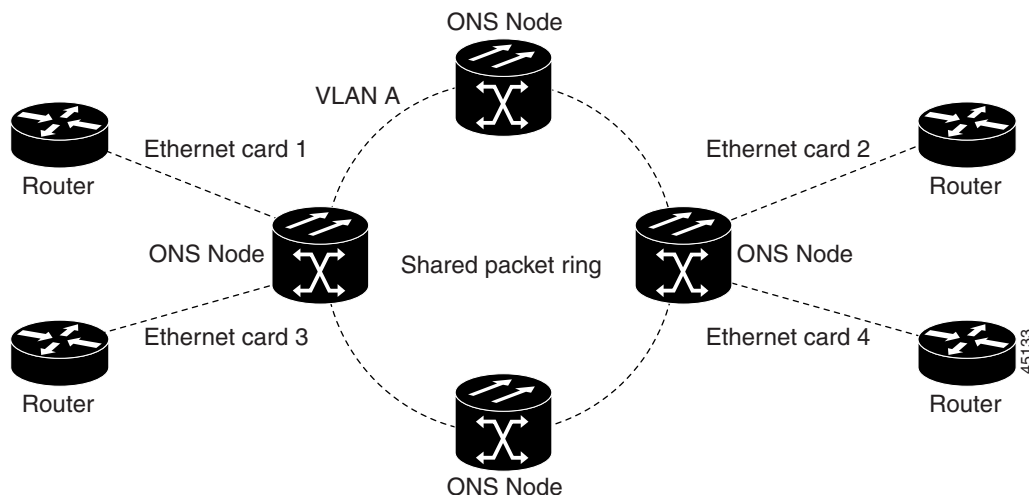


#### Note

Port-mapped mode eliminates issues inherent in other E-Series modes and detailed in the field notice, “E-Series Ethernet Line Card Packet Forwarding Limitations.”

#### 14.3.1.1 E-Series Multicard EtherSwitch Group

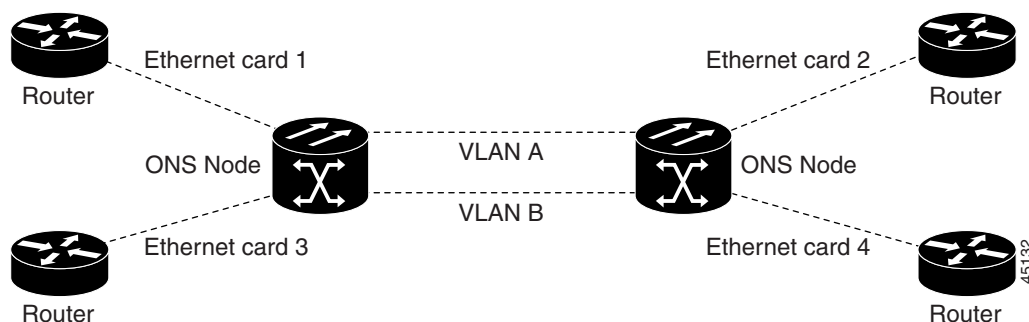
Multicard EtherSwitch Group provisions two or more Ethernet cards to act as a single Layer 2 switch. It supports one VC4-3c circuit, two VC4-2c circuits, or six VC4 circuits. Each multicard switch may connect up to a total of VC4-3c in SDH circuits. When provisioned as an add or drop node of a shared packet ring circuit, the effective bandwidth doubles, supporting VC4-3c in each direction of the ring. [Figure 14-9](#) illustrates a multicard EtherSwitch configuration.

**REVIEW DRAFT—CISCO CONFIDENTIAL****Figure 14-9 Multicard EtherSwitch Configuration****Caution**

Whenever you terminate two VC4-2c multicard EtherSwitch circuits on an Ethernet card and later delete the first circuit, also delete the remaining VC4-2c circuit before you provision an VC4 circuit to the card. If you attempt to create an VC4 circuit after only deleting the first VC4-2c circuit, the VC4 circuit will not work, but no alarms will indicate this condition. To avoid this situation, delete the second VC4-2c before creating an VC4 circuit.

**14.3.1.2 E-Series Single-Card EtherSwitch**

Single-card EtherSwitch allows each Ethernet card to remain a single switching entity within the ONS 15454 SDH shelf. This option allows VC4-4c worth of bandwidth between two Ethernet circuit endpoints. [Figure 14-10](#) illustrates a single-card EtherSwitch configuration.

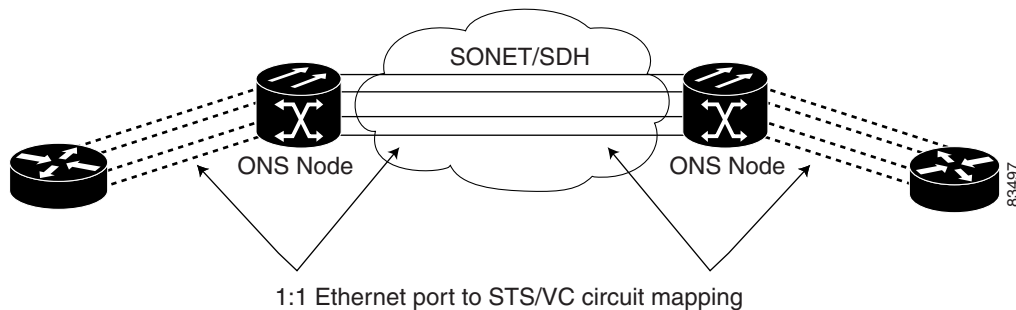
**Figure 14-10 Single-Card EtherSwitch Configuration****14.3.1.3 Port-Mapped (Linear Mapper)**

Port-mapped mode, also referred to as linear mapper, configures the E-Series card to map a specific E-Series Ethernet port to one of the card's specific STM circuits ([Figure 14-11](#)). Port-mapped mode ensures Layer 1 transport has low latency for unicast, multicast, and mixed traffic. Ethernet and Fast Ethernet on the E100T-G card operate at line-rate speed. Gigabit Ethernet transport is not line rate

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because the E1000-2-G has a maximum bandwidth of VC4-4c. Ethernet frame sizes up to 1522 bytes are also supported, which allows transport of IEEE 802.1Q tagged frames. The larger maximum frame size of Q-in-Q frames (802.1Q in 802.1Q wrapped frames) are not supported.

**Figure 14-11** E-Series Mapping Ethernet Ports To SDH STM Circuits



Port-mapped mode disables Layer 2 functions supported by the E-Series in single-card and multcard mode, including STP, VLANs, and MAC address learning. It significantly reduces the service-affecting time for cross-connect and TCC2 card switches.

Port-mapped mode does not support VLANs in the same manner as multcard and single-card mode. The ports of E-Series cards in multcard and single-card mode can join specific VLANs. E-Series cards in port-mapped mode do not have this Layer 2 capability and only transparently transport external VLANs over the mapped connection between ports. An E-Series card in port-mapped mode does not inspect the tag of the transported VLAN, so a VLAN range of 1 through 4096 can be transported in port-mapped mode.

Port-mapped mode does not inspect or validate the Ethernet frame header. The Ethernet CRC is validated, and any frame with an invalid Ethernet CRC is discarded.

Port-mapped mode also allows the creation of STM-N circuits between any two E-Series cards; it does not allow an E-Series cards to connect to the ML-Series or G-Series cards.

## 14.3.2 E-Series IEEE 802.3z Flow Control

The E100T-G card in any mode and the E1000-G card in port-mapped mode support IEEE 802.3z symmetrical flow control and propose symmetric flow control when auto-negotiating with attached Ethernet devices. For flow control to operate, both the E-Series port and the attached Ethernet device must be set to auto negotiation (AUTO) mode. The attached Ethernet device may also need to have flow control enabled. The flow-control mechanism allows the E-Series to respond to pause frames sent from external devices and to send pause frames to external devices.

Flow control matches the sending and receiving device throughput to that of the bandwidth of the STM-N circuit. For example, a router might transmit to the Gigabit Ethernet port on the E-Series card in port-mapped mode. The data rate transmitted by the router can occasionally exceed 622 Mbps, but the ONS 15454 SDH circuit assigned to the E-Series port in port-mapped mode is a maximum of VC4-4c (622.08 Mbps). In this scenario, the ONS 15454 SDH sends out a pause frame and requests that the router delay its transmission for a certain period of time.

**REVIEW DRAFT – CISCO CONFIDENTIAL****Note**

To enable flow control between an E-Series in port-mapped mode and a SmartBits test set, manually set bit 5 of the MII register to 0 on the SmartBits test set. To enable flow control between an E-Series in port-mapped mode and an Ixia test set, select Enable the flow control in the Properties menu of the attached Ixia port.

### 14.3.3 E-Series VLAN Support

Users can provision up to 509 VLANs per network with the CTC software. Specific sets of ports define the broadcast domain for the ONS 15454 SDH. The definition of VLAN ports includes all Ethernet and packet-switched SDH port types. All VLAN IP address discovery, flooding, and forwarding is limited to these ports.

The ONS 15454 SDH IEEE 802.1Q-based VLAN mechanism provides logical isolation of subscriber LAN traffic over a common SDH transport infrastructure. Each subscriber has an Ethernet port at each site, and each subscriber is assigned to a VLAN. Although the subscriber's VLAN data flows over shared circuits, the service appears to the subscriber as a private data transport.

**Note**

Port-mapped mode does not support VLANs.

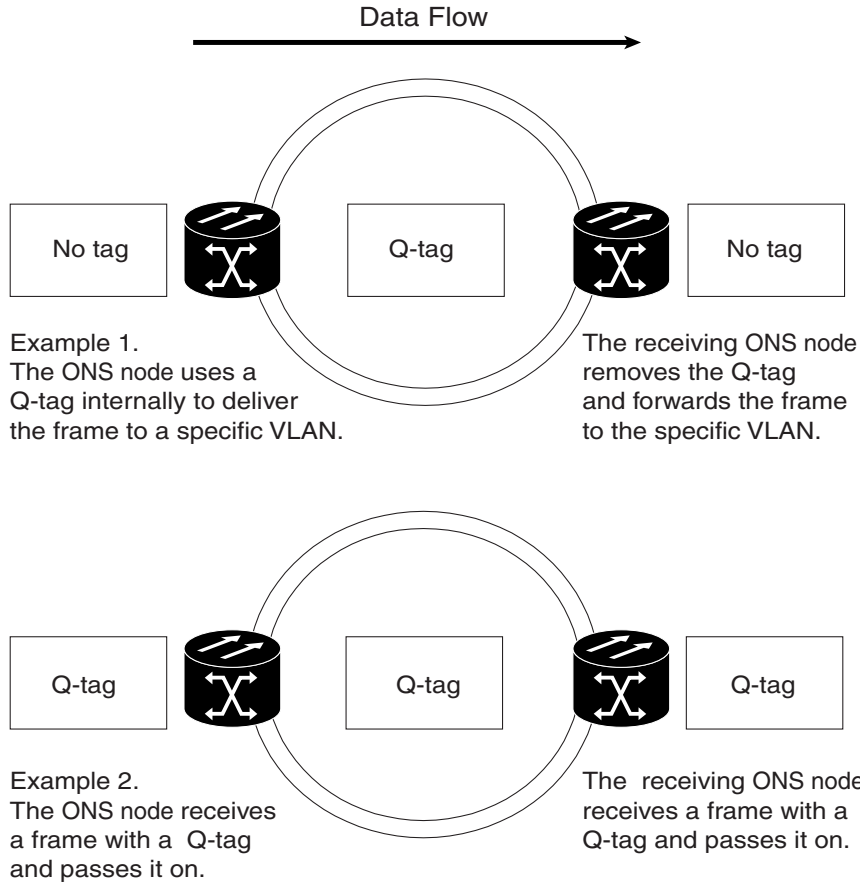
The number of VLANs used by circuits and the total number of VLANs available for use appears in CTC on the VLAN counter.

### 14.3.4 E-Series Q-Tagging (IEEE 802.1Q)

E-Series cards in single-card and multicard mode support IEEE 802.1Q. IEEE 802.1Q allows the same physical port to host multiple IEEE 802.1Q VLANs. Each IEEE 802.1Q VLAN represents a different logical network. E-Series cards in port-mapped mode transport IEEE 802.1Q tags (Q-tags), but do not remove or add these tags.

The ONS 15454 SDH works with Ethernet devices that support IEEE 802.1Q and those that do not support IEEE 802.1Q. If a device attached to an ONS 15454 SDH Ethernet port does not support IEEE 802.1Q, the ONS 15454 SDH uses Q-tags internally only. The ONS 15454 SDH associates these Q-tags with specific ports.

With Ethernet devices that do not support IEEE 802.1Q, the ONS 15454 SDH takes non-tagged Ethernet frames that enter the ONS network and uses a Q-tag to assign the packet to the VLAN associated with the ONS network's ingress port. The receiving ONS node removes the Q-tag when the frame leaves the ONS network (to prevent older Ethernet equipment from incorrectly identifying the IEEE 802.1Q packet as an illegal frame). The ingress and egress ports on the ONS network must be set to Untag for the removal to occur. Untag is the default setting for ONS ports. Example 1 in [Figure 14-12](#) illustrates Q-tag use only within an ONS network.

**REVIEW DRAFT – CISCO CONFIDENTIAL****Figure 14-12 Q-Tag Moving through VLAN**

The ONS 15454 SDH uses the Q-tag attached by the external Ethernet devices that support IEEE 802.1Q. Packets enter the ONS network with an existing Q-tag; the ONS 15454 SDH uses this same Q-tag to forward the packet within the ONS network and leaves the Q-tag attached when the packet leaves the ONS network. The entry and egress ports on the ONS network must be set to Tagged for this process to occur. Example 2 in [Figure 14-12](#) illustrates the handling of packets that both enter and exit the ONS network with a Q-tag.

For more information about setting ports to Tagged and Untag, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

**Caution**

ONS 15454 SDHs propagate VLANs whenever a node appears on the network view of another node, regardless of whether the nodes are in the same SDH network or connect through DCC. For example, if two ONS 15454 SDHs without DCC connectivity belong to the same login node group, VLANs propagate between the two ONS 15454 SDHs. VLAN propagation happens even though the ONS 15454 SDHs do not belong to the same SDH ring.



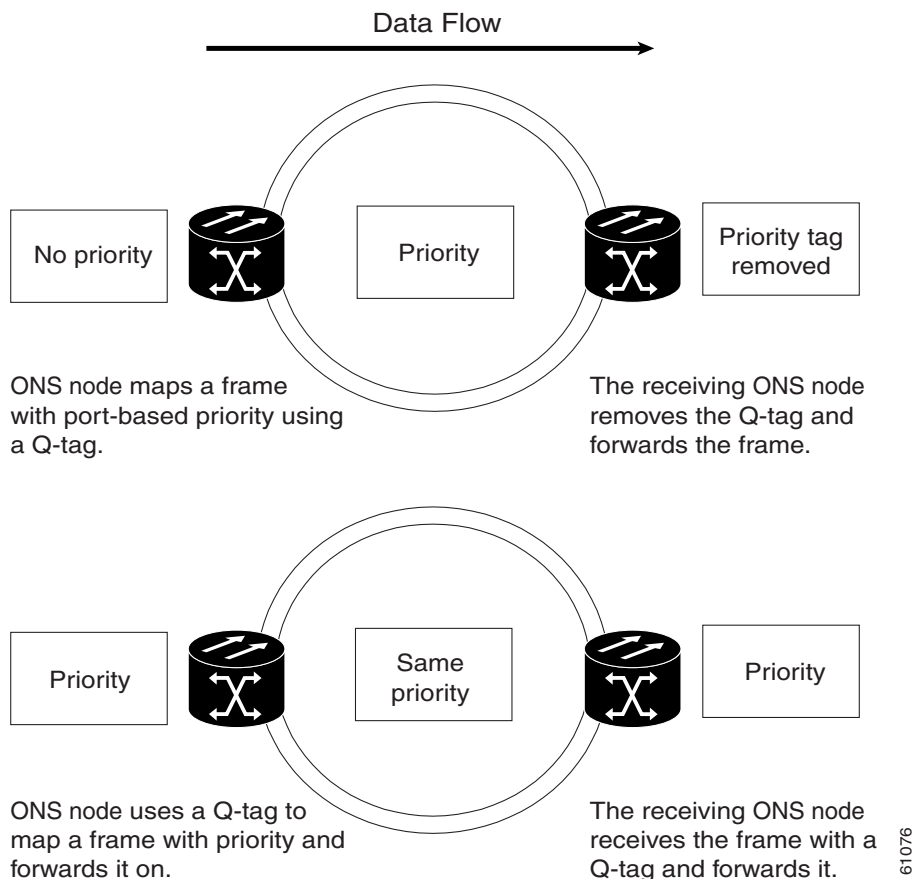
**REVIEW DRAFT – CISCO CONFIDENTIAL****14.3.5 E-Series Priority Queuing (IEEE 802.1Q)**

Networks without priority queuing handle all packets on a FIFO basis. Priority queuing reduces the impact of network congestion by mapping Ethernet traffic to different priority levels. The ONS 15454 SDH supports priority queuing. The ONS 15454 SDH maps the eight priorities specified in IEEE 802.1Q to two queues, low priority and high priority number (Table 14-1).

**Table 14-1 Priority Queuing**

User Priority	Queue	Allocated Bandwidth
0,1,2,3	Low	30%
4,5,6,7	High	70%

Q-tags carry priority queuing information through the network (Figure 14-13).

**Figure 14-13 Priority Queuing Process**

The ONS 15454 SDH uses a “leaky bucket” algorithm to establish a weighted priority (not a strict priority). A weighted priority gives high-priority packets greater access to bandwidth, but does not totally preempt low-priority packets. During periods of network congestion, roughly 70 percent of bandwidth goes to the high-priority queue and the remaining 30 percent goes to the low-priority queue. A network that is too congested will drop packets.

**REVIEW DRAFT – CISCO CONFIDENTIAL****Note**

IEEE 802.1Q was formerly IEEE 802.1P.

**Note**

E-Series cards in port-mapped mode and G-Series cards do not support priority queuing (IEEE 802.1Q).

## 14.3.6 E-Series Spanning Tree (IEEE 802.1D)

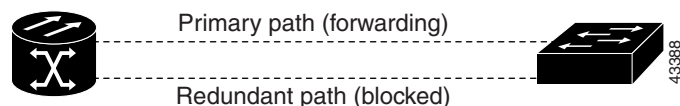
The Cisco ONS 15454 SDH operates Spanning Tree Protocol (STP) according to IEEE 802.1D when an Ethernet card is installed. The E-Series card supports common STPs on a per circuit basis up to a total of eight STP instances. It does not support per-VLAN STP. In single-card mode, STP can be disabled or enabled on a per circuit basis during circuit creation. Disabling STP will preserve the number of available STP instances.

STP operates over all packet-switched ports including Ethernet and STM-N ports. On Ethernet ports, STP is enabled by default but can be disabled. A user can also disable or enable STP on a circuit-by-circuit basis on unstitched Ethernet cards in a point-to-point configuration. However, turning off STP protection on a circuit-by-circuit basis means that the ONS 15454 SDH system is not protecting the Ethernet traffic on this circuit, and the Ethernet traffic must be protected by another mechanism in the Ethernet network. On STM-N interface ports, the ONS 15454 SDH activates STP by default, and STP cannot be disabled.

The Ethernet card can enable STP on the Ethernet ports to create redundant paths to the attached Ethernet equipment. STP connects cards so that both equipment and facilities are protected against failure.

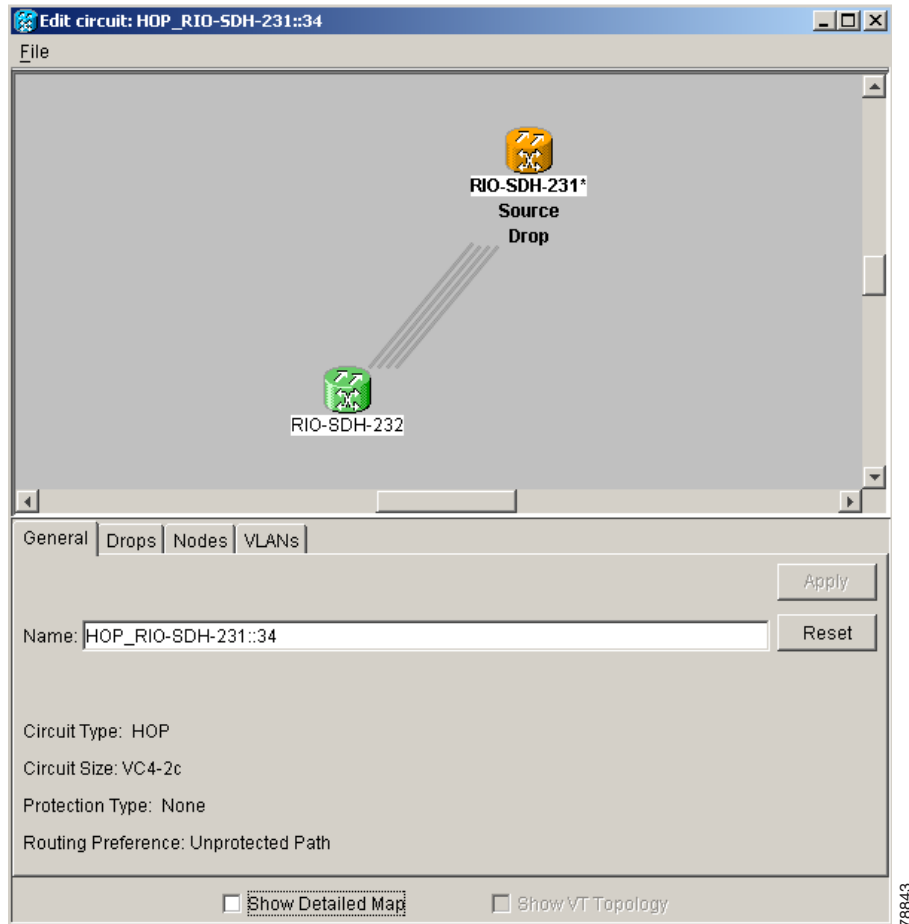
STP detects and eliminates network loops. When STP detects multiple paths between any two network hosts, STP blocks ports until only one path exists between any two network hosts (Figure 14-14). The single path eliminates possible bridge loops. This is crucial for shared packet rings, which naturally include a loop.

**Figure 14-14** An STP Blocked Path



To remove loops, STP defines a tree that spans all the switches in an extended network. STP forces certain redundant data paths into a standby (blocked) state. If one network segment in the STP becomes unreachable, the STP algorithm reconfigures the STP topology and reactivates the blocked path to reestablish the link. STP operation is transparent to end stations, which do not discriminate between connections to a single LAN segment or to a switched LAN with multiple segments. The ONS 15454 SDH supports one STP instance per circuit and a maximum of eight STP instances per ONS 15454 SDH.

The Circuit window shows forwarding spans and blocked spans on the spanning tree map (Figure 14-15).

**REVIEW DRAFT—CISCO CONFIDENTIAL****Figure 14-15 Spanning Tree Map on the Circuit Window****Note**

Green represents forwarding spans and purple represents blocked (protect) spans. If you have a packet ring configuration, at least one span should be purple.

**Caution**

Multiple circuits with STP protection enabled will incur blocking if the circuits traverse a common card and use the same VLAN.

**Note**

E-Series port-mapped mode does not support STP (IEEE 8021.D).

**14.3.6.1 E-Series Multi-Instance Spanning Tree and VLANs**

The ONS 15454 SDH can operate multiple instances of STP to support VLANs in a looped topology. You can dedicate separate circuits across the SDH ring for different VLAN groups. Each circuit runs its own STP to maintain VLAN connectivity in a multiring environment.

**REVIEW DRAFT – CISCO CONFIDENTIAL****14.3.6.2 Spanning Tree on a Circuit-by-Circuit Basis**

You can also disable or enable STP on a circuit-by-circuit basis on single-card EtherSwitch E-Series cards in a point-to-point configuration. This feature allows customers to mix spanning tree protected circuits with unprotected circuits on the same card. It also allows two single-card EtherSwitch E-Series cards on the same node to form an intranode circuit.

**14.3.6.3 E-Series Spanning Tree Parameters**

Default STP parameters are appropriate for most situations (Table 14-2). Contact the Cisco Technical Assistance Center (Cisco TAC) before you change the default STP parameters.

**Table 14-2 Spanning Tree Parameters**

Parameter	Description
BridgeID	ONS 15454 SDH unique identifier that transmits the configuration bridge protocol data unit (BPDU); the bridge ID is a combination of the bridge priority and the ONS 15454 SDH MAC address
TopoAge	Amount of time in seconds since the last topology change
TopoChanges	Number of times the STP topology has been changed since the node booted up
DesignatedRoot	STP's designated root for a particular STP instance
RootCost	Total path cost to the designated root
RootPort	Port used to reach the root
MaxAge	Maximum time that received-protocol information is retained before it is discarded
HelloTime	Time interval, in seconds, between the transmission of configuration BPDUs by a bridge that is the spanning tree root or is attempting to become the spanning tree root
HoldTime	Minimum time period, in seconds, that elapses during the transmission of configuration information on a given port
ForwardDelay	Time spent by a port in the listening state and the learning state

**14.3.6.4 E-Series Spanning Tree Configuration**

To view the spanning tree configuration, at the node view click the Provisioning > Etherbridge > Spanning Trees tabs. (Table 14-3).

**Table 14-3 Spanning Tree Configuration**

Column	Default Value	Value Range
Priority	32768	0 to 65535
Bridge max age	20 seconds	6 to 40 seconds
Bridge Hello Time	2 seconds	1 to 10 seconds
Bridge Forward Delay	15 seconds	4 to 30 seconds

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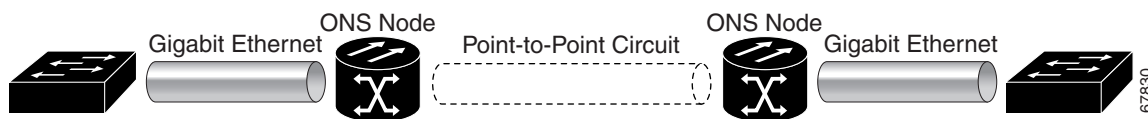
## 14.4 G-Series Circuit Configurations

This section explains G-Series point-to-point circuits and manual cross-connects. Ethernet manual cross-connects allow you to cross connect individual Ethernet circuits to an STM-N channel on the ONS 15454 SDH optical interface and also to bridge non-ONS SDH network segments.

### 14.4.1 G-Series Point-to-Point Ethernet Circuits

G-Series cards support point-to-point circuit configurations (Figure 14-16). Provisionable circuit sizes are VC4, VC4-2c, VC4-3c, VC4-4c, VC4-8c, and VC4-16C. Each Ethernet port maps to a unique STM-N circuit of the G-Series card.

**Figure 14-16** G-Series Point-to-Point Circuit



The G-Series supports any combination of up to four circuits from the list of valid circuit sizes; however, the circuit sizes can add up to no more than VC4-16.

Because of hardware constraints, the card imposes an additional restriction on the combinations of circuits that can be dropped onto a G-Series card. These restrictions are transparently enforced by the ONS 15454 SDH, and you do not need to keep track of restricted circuit combinations.

When a single VC4-8c terminates on a card, the remaining circuits on that card can be another single VC4-8c or any combination of circuits of VC4-4c size or less that add up to no more than VC4-4c (that is, a total of 12 VC4s on the card).

If VC4-8c circuits are not being dropped on the card, the full VC4-16 bandwidth can be used with no restrictions (for example, using either a single VC4-16C or 4 VC4-4c circuits).

**Note**

The VC4-8c restriction only applies when a single VC4-8c circuit is dropped; therefore, you can easily minimize the impact of this restriction. Group the VC4-8c circuits together on a card separate from circuits of other sizes. The grouped circuits can be dropped on other G-Series cards on the ONS 15454 SDH.

**Caution**

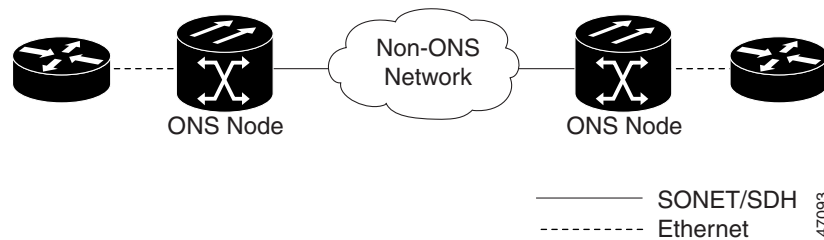
G-Series cards do not connect with E-series cards.

### 14.4.2 G-Series Manual Cross-Connects

ONS 15454 SDHs require end-to-end CTC visibility between nodes for normal provisioning of Ethernet circuits. When other vendors' equipment sits between ONS 15454 SDHs, open system interconnection (OSI)/Transient Addressing for Related Processes (TARP)-based equipment does not allow tunneling of the ONS 15454 SDH TCP/IP-based DCC. To circumvent inconsistent DCCs, the Ethernet circuit must be manually cross connected to an STM channel using the non-ONS network. Manual cross-connects allows an Ethernet circuit to run from ONS node to ONS node while utilizing the non-ONS network (Figure 14-17).

**REVIEW DRAFT – CISCO CONFIDENTIAL****Note**

In this chapter, “cross-connect” and “circuit” have the following meanings: Cross-connect refers to the connections that occur within a single ONS 15454 SDH to allow a circuit to enter and exit an ONS 15454 SDH. Circuit refers to the series of connections from a traffic source (where traffic enters the ONS 15454 SDH network) to the drop or destination (where traffic exits an ONS 15454 SDH network).

**Figure 14-17 G-Series Manual Cross-Connects**

## 14.5 E-Series Circuit Configurations

Ethernet circuits can link ONS nodes through point-to-point (straight), shared packet ring, or hub-and-spoke configurations. Two nodes usually connect with a point-to-point configuration. More than two nodes usually connect with a shared packet ring configuration or a hub-and-spoke configuration. Ethernet manual cross-connects allow you to cross connect individual Ethernet circuits to an STM channel on the ONS 15454 SDH optical interface and also to bridge non-ONS SDH network segments. For circuit configuration procedures, refer to the “Create Circuits and Low-Order Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

**Note**

Before making Ethernet connections, choose an VC4, VC4-2c, VC4-3c, or VC4-4c circuit size.

**Note**

To make an VC4-4c Ethernet circuit, Ethernet cards must be configured in single-card EtherSwitch or port-mapped mode. Multicard mode does not support VC4-4c Ethernet circuits.

### 14.5.1 Port-Mapped Mode and Single-card EtherSwitch Circuit Scenarios

Four scenarios exist for provisioning maximum single-card EtherSwitch bandwidth:

1. VC4-4c
2. VC4-2c + VC4-2c
3. VC4-2c + VC4 + VC4
4. VC4 + VC4 + VC4 + VC4

**Note**

When configuring Scenario 3, the VC4-2c must be provisioned before either of the VC4 circuits. When configuring Scenarios 3 and 4, the STM 6c must be provisioned before the smaller STM circuits.

**REVIEW DRAFT—CISCO CONFIDENTIAL****14.5.2 E-Series Point-to-Point Ethernet Circuits**

The ONS 15454 SDH can set up a point-to-point (straight) Ethernet circuit as single-card, port-mapped or multicard circuit. Multicard EtherSwitch limits bandwidth to VC4-3c between two Ethernet circuit points, but allows adding nodes and cards and making a shared packet ring (Figure 14-18).

**Figure 14-18 Multicard EtherSwitch Point-to-Point Circuit**

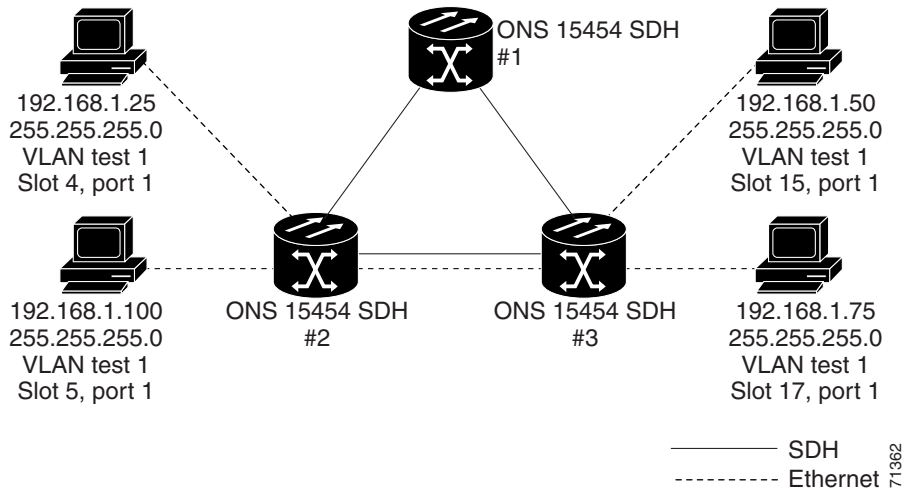
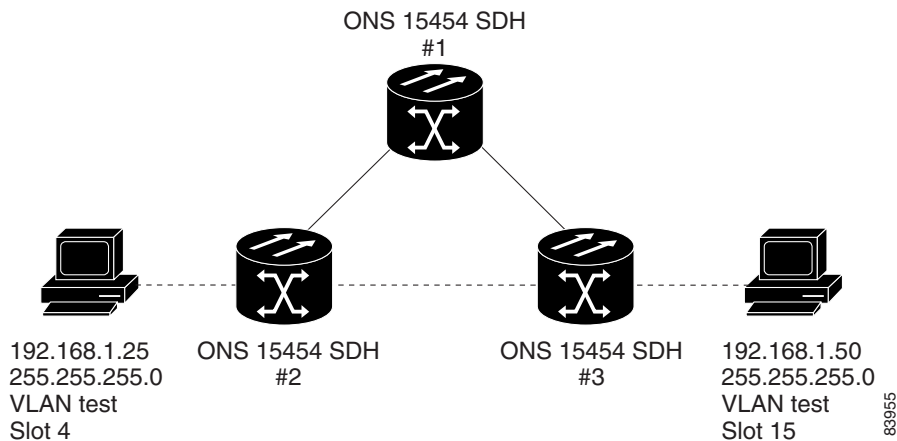


Figure 14-19 shows a single-card EtherSwitch. Port-mapped mode allows a full VC4-4c of bandwidth between two Ethernet circuit endpoints.

**Figure 14-19 Single-Card EtherSwitch or Port-Mapped Point-to-Point Circuit**

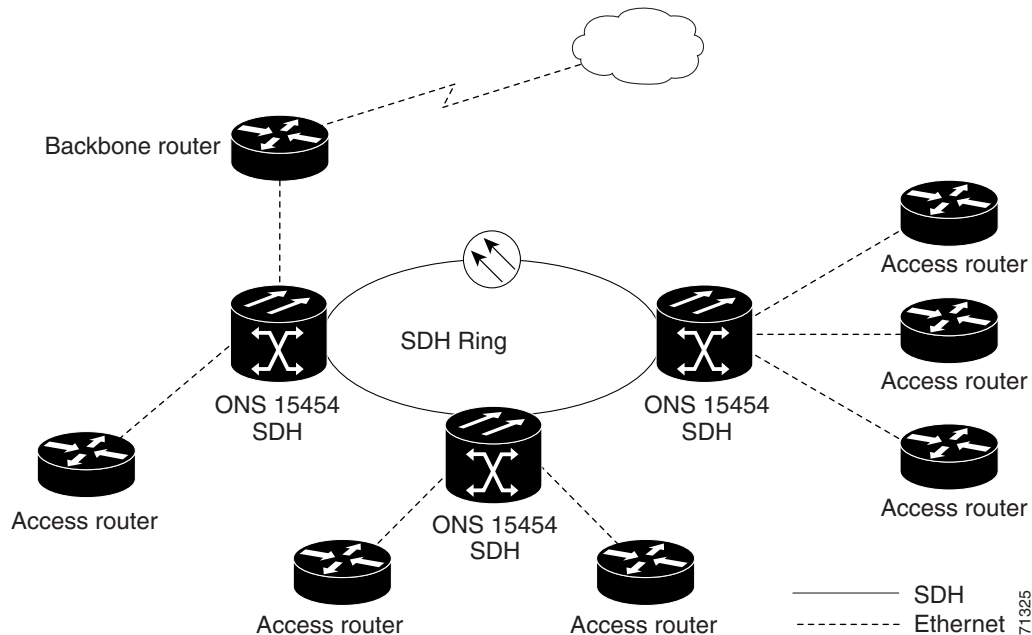
**Note**

A Port-mapped point-to-point circuit does not contain a VLAN.

**REVIEW DRAFT – CISCO CONFIDENTIAL****14.5.3 E-Series Shared Packet Ring Ethernet Circuits**

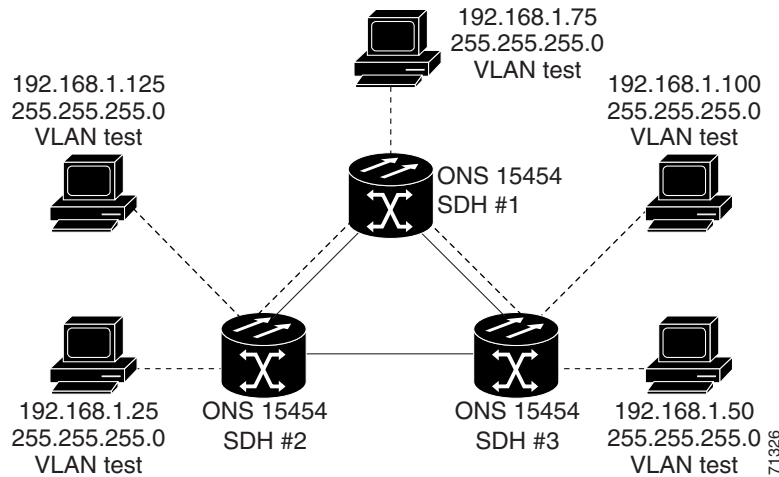
A shared packet ring allows nodes other than the source and destination nodes to access an Ethernet STM circuit. The E-Series card ports on the additional nodes can share the circuit's VLAN and bandwidth. [Figure 14-20](#) illustrates a shared packet ring. Your network architecture may differ from the example.

**Figure 14-20** Shared Packet Ring Ethernet Circuit

**14.5.4 E-Series Hub-and-Spoke Ethernet Circuit Provisioning**

The hub-and-spoke configuration connects point-to-point circuits (the spokes) to an aggregation point (the hub). In many cases, the hub links to a high-speed connection and the spokes are Ethernet cards. [Figure 14-21](#) illustrates a hub-and-spoke ring. Your network architecture may differ from the example.



**REVIEW DRAFT—CISCO CONFIDENTIAL****Figure 14-21 Hub-and-Spoke Ethernet Circuit**

## 14.5.5 E-Series Ethernet Manual Cross-Connects

ONS 15454 SDHs require end-to-end CTC visibility between nodes for normal provisioning of Ethernet circuits. When other vendors' equipment sits between ONS 15454 SDHs, OSI/TARP-based equipment does not allow tunneling of the ONS 15454 SDH TCP/IP-based DCC. To circumvent inconsistent DCC, the Ethernet circuit must be manually cross connected to an STM channel using the non-ONS network. The manual cross-connect allows an Ethernet circuit to run from ONS node to ONS node utilizing the non-ONS network.

**Note**

In this chapter, “cross-connect” and “circuit” have the following meanings: Cross-connect refers to the connections that occur within a single ONS 15454 SDH to allow a circuit to enter and exit an ONS 15454 SDH. Circuit refers to the series of connections from a traffic source (where traffic enters the ONS 15454 SDH network) to the drop or destination (where traffic exits an ONS 15454 SDH network).

## 14.6 Remote Monitoring Specification Alarm Thresholds

The ONS 15454 SDH features remote monitoring (RMON) that allows network operators to monitor the health of the network with a network management system (NMS).

One of the ONS 15454 SDH's RMON MIBs is the Alarm group, which contains the alarmTable. An NMS uses the alarmTable to find the alarm-causing thresholds for network performance. The thresholds apply to the current 15-minute interval and the current 24-hour interval. RMON monitors several variables, such as Ethernet collisions, and triggers an event when the variable crosses a threshold during that time interval. For example, if a threshold is set at 1000 collisions and 1001 collisions occur during the 15-minute interval, an event triggers. CTC allows you to provision these thresholds for Ethernet statistics.

[Table 14-4](#) defines the variables you can provision in CTC. For example, to set the collision threshold, choose **etherStatsCollisions** from the Variable menu.

**REVIEW DRAFT – CISCO CONFIDENTIAL****Table 14-4 Ethernet Threshold Variables (MIBs)**

<b>Variable</b>	<b>Definition</b>
ifInOctets	Total number of octets received on the interface, including framing octets
ifInUcastPkts	Total number of unicast packets delivered to an appropriate protocol
ifInMulticastPkts	Number of multicast frames received error free (not supported by E-Series)
ifInBroadcastPkts	Number of packets, delivered by this sublayer to a higher (sub)layer, which were addressed to a broadcast address at this sublayer (not supported by E-Series)
ifInDiscards	Number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol (not supported by E-Series)
ifInErrors	Number of inbound packets discarded because they contain errors
ifOutOctets	Total number of transmitted octets, including framing packets
ifOutUcastPkts	Total number of unicast packets requested to transmit to a single address
ifOutMulticastPkts	Number of multicast frames transmitted error free (not supported by E-Series)
ifOutBroadcastPkts	Total number of packets that higher-level protocols requested be transmitted, and which were addressed to a broadcast address at this sublayer, including those that were discarded or not sent (not supported by E-Series)
ifOutDiscards	Number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted (not supported by E-Series)
dot3statsAlignmentErrors	Number of frames with an alignment error, that is, the length is not an integral number of octets and the frame cannot pass the Frame Check Sequence (FCS) test
dot3StatsFCSErrors	Number of frames with framecheck errors, that is, there is an integral number of octets, but an incorrect FCS
dot3StatsSingleCollisionFrames	Number of successfully transmitted frames that had exactly one collision
dot3StatsMutlipleCollisionFrame	Number of successfully transmitted frames that had multiple collisions
dot3StatsDeferredTransmissions	Number of times the first transmission was delayed because the medium was busy
dot3StatsExcessiveCollision	Number of frames where transmissions failed because of excessive collisions
dot3StatsLateCollision	Number of times that a collision was detected later than 64 octets into the transmission (also added into collision count)

**REVIEW DRAFT – CISCO CONFIDENTIAL****Table 14-4 Ethernet Threshold Variables (MIBs) (continued)**

<b>Variable</b>	<b>Definition</b>
dot3StatsFrameTooLong	Number of received frames that were larger than the maximum size permitted
dot3StatsCarrierSenseErrors	Number of transmission errors on a particular interface that are not otherwise counted (not supported by E-Series)
dot3StatsSQETestErrors	Number of times that the SQE TEST ERROR message is generated by the PLS sublayer for a particular interface (not supported by E-Series)
etherStatsJabbers	Total number of Octets of data (including bad packets) received on the network
etherStatsUndersizePkts	Number of packets received with a length less than 64 octets
etherStatsFragments	Total number of packets that are not an integral number of octets or have a bad FCS, and that are less than 64 octets long
etherStatsOversizePkts	Total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed
etherStatsOctets	Total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets)
etherStatsPkts64Octets	Total number of packets received (including error packets) that were 64 octets in length
etherStatsPkts65to127Octets	Total number of packets received (including error packets) that were 65 to 172 octets in length
etherStatsPkts128to255Octets	Total number of packets received (including error packets) that were 128 to 255 octets in length
etherStatsPkts256to511Octets	Total number of packets received (including error packets) that were 256 to 511 octets in length
etherStatsPkts512to1023Octets	Total number of packets received (including error packets) that were 512 to 1023 octets in length
etherStatsPkts1024to1518Octets	Total number of packets received (including error packets) that were 1024 to 1518 octets in length
etherStatsJabbers	Total number of packets longer than 1518 octets that were not an integral number of octets or had a bad FCS
etherStatsCollisions	Best estimate of the total number of collisions on this segment
etherStatsCollisionFrames	Best estimate of the total number of frame collisions on this segment
etherStatsCRCAlignErrors	Total number of packets with a length between 64 and 1518 octets, inclusive, that had a bad FCS or were not an integral number of octets in length
receivePauseFrames	Number of received 802.x pause frames (not supported by E-Series)
transmitPauseFrames	Number of transmitted 802.x pause frames (not supported by E-Series)

**REVIEW DRAFT – CISCO CONFIDENTIAL****Table 14-4** Ethernet Threshold Variables (MIBs) (continued)

<b>Variable</b>	<b>Definition</b>
receivePktsDroppedInternalCongestion	Number of received frames dropped because of frame buffer overflow and other reasons (not supported by E-Series)
transmitPktsDroppedInternalCongestion	Number of frames dropped in the transmit direction because of frame buffer overflow and other reasons (not supported by E-Series)
txTotalPkts	Total number of transmit packets (not supported by E-Series)
rxTotalPkts	Total number of receive packets (not supported by E-Series)



# Hardware Specifications

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This appendix contains hardware and software specifications for the ONS 15454 SDH.

## A.1 Shelf Specifications

This section provides specifications for shelf bandwidth; a list of topologies; Cisco Transport Controller (CTC) specifications; LAN, TL1, modem, alarm, and electrical interface assembly (EIA) interface specifications; database, timing, power, and environmental specifications; and shelf dimensions.

### A.1.1 Bandwidth

The ONS 15454 SDH has the following bandwidth specifications:

- 60 Gbps per shelf
- Total bandwidth: 180 Gbps per rack (assuming there are 3 shelves)
- Data plane bandwidth: 120 Gbps per rack (assuming there are 3 shelves)
- SDH plane bandwidth: 60 Gbps per rack (assuming there are 3 shelves)

### A.1.2 Configurations

The ONS 15454 SDH can be configured as follows:

- Digital cross-connect
- Terminal mode
- Linear add-drop multiplexer (ADM)
- Two-fiber multiplex section-shared protection ring (MS-SPRing)
- Four-fiber MS-SPRing
- Multiring interconnection
- Subnetwork connection protection (SNCP)
- Extended SNCP
- Virtual rings
- Hybrid SDH network topology

- Regenerator mode
- Wavelength multiplexer

## A.1.3 Cisco Transport Controller

CTC, the ONS 15454 SDH craft interface software, has the following specifications:

- 10BaseT
- TCC2/TCC2P access: RJ-45 connector
- Front Mount Electrical Connection (FMEC) access: LAN connector on MIC-C/T/P faceplate

## A.1.4 External LAN Interface

The ONS 15454 SDH external LAN interface has the following specifications:

- 10BaseT Ethernet
- FMEC access: LAN connector on MIC-C/T/P faceplate

## A.1.5 Alarm Interface

The ONS 15454 SDH alarm interface has the following specifications:

- Visual: Critical, Major, Minor, Remote
- Audible: Critical, Major, Minor, Remote
- Alarm inputs: Common 32-VDC output for all alarm-inputs, closed contact limited to 2 mA
- Control outputs: Open contact maximum 60 VDC, closed contact maximum 100 mA
- FMEC access: 62-Pin DB connector on the MIC-A/P faceplate

## A.1.6 Database Storage

The ONS 15454 SDH has the following database storage specifications:

- Nonvolatile memory: 128 MB, 3.0 V flash memory

## A.1.7 Timing Interface

The ONS 15454 SDH timing interface has the following specifications:

- 2 coaxial inputs
- 2 coaxial outputs
- FMEC access: 1.0/2.3 miniature coax connectors on the MIC-C/T/P faceplate

## A.1.8 System Timing

The ONS 15454 SDH has the following system timing specifications:

- Stratum 3E, per ITU-T G.813
- Free running accuracy: +/- 4.6 ppm
- Holdover stability:  $3.7 \exp -7/\text{day}$ , including temperature (< 255 slips in first 24 hours)
- Reference: External building integrated timing supply (BITS), line, internal

## A.1.9 System Power

The ONS 15454 SDH has the following power specifications:

- Input voltage: -48 VDC
- Power consumption: Configuration dependent, 53 W for fan tray; 650 W (maximum draw w/cards)
- Power requirements:
  - Nominal: -48 VDC
  - Tolerance limits: -40.5 to -57.0 VDC
- Power terminals: 3WK3 Combo-D power cable connector (MIC-A/P and MIC-C/T/P faceplates)
- Fusing: 100 A fuse panel; minimum 30 A fuse per shelf

## A.1.10 System Environmental Specifications

The ONS 15454 SDH has the following environmental specifications:

- Operating temperature: 0 to +40 degrees Celsius (32 to 104 degrees Fahrenheit)
- Operating humidity: 5 to 95%, noncondensing

## A.1.11 Dimensions

The ONS 15454 SDH shelf assembly has the following dimensions:

- Height: 616.5 mm (24.27 in.)
- Width: 535 mm (17 in.) without mounting ears attached
- Depth: 280 mm (11.02 in.)
- Weight: 26 kg empty (57.3 lb)

## A.2 SFP Specifications

[Table A-1](#) lists the specifications for the available Small Form-factor Pluggables (SFPs).

**Table A-1 SFP Specifications**

SFP	Interface	Transmitter Output Power Min/Max (dBm)	Receiver Input Power Min/Max (dBm)
15454-SFP-LC-SX/ 15454E-SFP-LC-SX	Gigabit Ethernet (GE)	-9.5 to -4	-17 to 0
15454-SFP-LC-LX/ 15454E-SFP-LC-LX	GE	-9.5 to -3	-19 to -3
15454-SFP3-1-IR=	OC-3	-15 to -8	-23 to -8
15454E-SFP-L.1.1=	STM-1	-15 to -8	-34 to -10
15454-SFP12-4-IR=	OC-12, D1 Video	-15 to -8	-28 to -7
15454E-SFP-L.4.1=	STM-4, D1 Video	-15 to -8	-28 to -8
15454-SFP-OC48-IR=	OC-48, DV6000 (C-Cor)	-5 to +0	-18 to +0
ONS-SE-2G-S1=	OC-48, STM-16	-10 to -3	-18 to -3
15454E-SFP-L.16.1=	STM-16, DV6000 (C-Cor)	-5 to +0	-18 to +0
15454-SFP-200/ 15454E-SFP-200	Enterprise System Connection (ESCON)	-8 to -4	-28 to -3
15454-SFP-GEFC-SX=/ 15454E-SFP-GEFC-S=	Fibre Channel (FC) (1 and 2 Gbps), fiber connectivity (FICON), GE	-10 to -3.5	-17 to 0 (1FC and 1GE) -15 to 0 (2FC)
15454-SFP-GE+-LX=/ 15454E-SFP-GE+-LX=	Fibre Channel (1 and 2 Gbps), FICON, GE, high definition television (HDTV)	-9.5 to -3.0	-20 to -3 (1FC, 1GE, and 2FC)

## A.3 General Card Specifications

This section provides power consumption and temperature ranges for all ONS 15454 SDH cards.

### A.3.1 Power Consumption

Table A-2 provides power consumption information for the ONS 15454 SDH cards.



Table A-2 Individual Card Power Requirements

Card Type	Card Name	Watts	Amperes	BTU/Hr
Control Cards	TCC2	26.00	0.54 (0.43 A at -60 V)	88.8
	TCC2P	27.00	0.56	92.2
	XC10G	78.60	1.64	268.4
	XC-VXL-10G	81.30	1.69	277.6
	XC-VXL-2.5G	81.30	1.69	277.6
	AIC-I	8.00	0.17	27.3
	Fan Tray -48 VDC	53.00	1.10	181.0
Electrical Cards	E1-N-14	24.00	0.50	81.9
	E1-42	38.10	0.79	130.1
	E3-12	44.00	0.92	150.2
	DS3i-N-12	30.00	0.63	102.4
	STM1E-12	59.40	1.24	202.8
	FMEC-E1	0.00	0.00	0.0
	FMEC-DS1/E1	0.00	0.00	0.0
	FMEC E1-120NP	0.00	0.00	0.0
	FMEC E1-120PROA	-0.1	via E1-42	—
	FMEC E1-120PROB	-0.1	via E1-42	—
	E1-75/120	0.00	0.00	0.0
	FMEC-E3/DS3	0.00	0.00	0.0
	FMEC STM1E 1:1	-8.8	via STM1E-12	—
	MIC-A/P	-0.13	via TCC2/TCC2P	—
	MIC-C/T/P	-0.38	via TCC2/TCC2P	—
Optical Cards	OC3 IR 4/STM1 SH 1310	19.20	0.40	65.6
	OC3IR/STM1SH 1310-8	23.00	0.48	78.5
	OC12 IR/STM4 SH 1310	9.28	0.19	31.7
	OC12 LR/STM4 LH 1310	9.28	0.19	31.7
	OC12 LR/STM4 LH 1550	9.28	0.19	31.7
	OC12 LR/STM4 SH 1310-4	35.60	0.74	121.6
	OC48 IR/STM16 SH AS 1310	37.20	0.78	127.0
	OC48 LR/STM16 LH AS 1550	37.20	0.78	127.0
	OC48 ELR/STM16 EH 100 GHz	31.20	0.65	106.5
	OC192 SR/STM64 IO 1310	42.00	0.88	143.4
	OC192 IR/STM64 SH 1550	44.00	0.92	150.2
	OC192 LR/STM64 LH 1550	72.20	1.50	246.5
	OC192 LR/STM64 LH ITU 15xx.xx	46.00	0.96	157.1

Table A-2 Individual Card Power Requirements (continued)

Card Type	Card Name	Watts	Amperes	BTU/Hr
Ethernet Cards	E100T-G	65.00	1.35	221.93
	E1000-2-G	53.50	1.11	182.67
	G1000-4	63.00 (including Gigabit Interface Converters [GBICs])	1.31	215.11
	G1K-4	63.00 (including GBICs)	1.31	215.11
	ML100T-12	53.00	1.10	181.0
	ML1000-2	49.00 (including SFPs)	1.02	167.3
Storage Access Networking	FC_MR-4 (Fibre Channel)	60	1.25	212.00

## A.3.2 Temperature Ranges

Table A-3 provides temperature ranges and product names for ONS 15454 SDH cards.


**Note**

The I-Temp symbol is displayed on the faceplate of an I-Temp compliant card. A card without this symbol is C-Temp compliant.

Table A-3 Card Temperature Ranges and Product Names

Card Type	Card Name	C-Temp Product Name (0 to +55 degrees Celsius, 32 to 131 degrees Fahrenheit)	I-Temp Product Name (-40 to +65 degrees Celsius, -40 to 149 degrees Fahrenheit)
Control Cards	TCC2	—	15454-TCC2
	TCC2P	—	15454-TCC2P
	XC-VXL-10G	15454E-XC-VXL10G	—
	XC-VXL-2.5G	15454E-XC-VXL-2.5G	—
	XC10G	15454-XC-10G	—
	AIC-I	—	15454-AIC-I
Electrical	E1-N-14	15454E-E1N-14	—
	E1-42	15454E-1-42	—
	E3-12	15454E-3-12	—
	DS3i-N-12	15454E-DS3i-N-12	—
	STM1E-12	15454E-STM1E-12	—
	FMEC-E1	15454E-FMEC-E1	—
	FMEC-DS1/E1	15454E-FMEC-DS1/E1	—
	FMEC E1-120NP	15454E-FMEC E1-120NP	—

Table A-3 Card Temperature Ranges and Product Names (continued)

Card Type	Card Name	C-Temp Product Name (0 to +55 degrees Celsius, 32 to 131 degrees Fahrenheit)	I-Temp Product Name (-40 to +65 degrees Celsius, -40 to 149 degrees Fahrenheit)
	FMEC E1-120PROA	15454E-FMEC E1-120PROA	—
	FMEC E1-120PROB	15454E-FMEC E1-120PROB	—
	E1-75/120	15454E-E1-75/120	—
	FMEC-E3/DS3	15454E-FMEC-E3/DS3	—
	FMEC STM1E 1:1	15454E-FMEC STM1E 1:1	—
	MIC-A/P	15454E-MIC-A/P	—
	MIC-C/T/P	15454E-MIC-C/T/P	—
<b>Optical</b>	OC3 IR 4/STM1 SH 1310	15454E-S1.1-4	—
	OC3 IR/STM1 SH 1310-8	15454E-S1.1-8	—
	OC12 IR/STM4 SH 1310	15454E-S4.1-1	—
	OC12 LR/STM4 LH 1310	15454E-L4.1-1	—
	OC12 LR/STM4 LH 1550	15454E-L4.2-1	—
	OC12 LR/STM4 SH 1310-4	15454E-L4.1-4	—
	OC48 IR/STM16 SH AS 1310	15454E-S16.1-1	—
	OC48 LR/STM16 LH AS 1550	15454E-S16.2-1	—
	OC48 ELR/STM16 EH 100 GHz	15454E-EL16HXXXX	—
	OC192 SR/STM64 IO 1310	15454E-I65.1	—
	OC192 IR/STM64 SH 1550	15454E-S64.2	—
	OC192 LR/STM64 LH 1550	15454E-L64.2.1	—
	OC192 LR/STM64 LH ITU 15xx.xx	15454E-64-LXX.X	—
<b>Ethernet</b>	E100T-G	15454-E100T-G	—
	E1000-2-G	15454-E1000-2-G	—
	G1000-4	15454-G1000-4	—
	G1K-4	15454-G1K-4	—
	ML100T-12	15454-ML100T-12	—
	ML1000-2	15454-ML1000-2	—
<b>Storage Access Networking</b>	FC_MR-4	15454-FC_MR-4	—

## A.4 Common Control Card Specifications

This section provides specifications for the common control cards.

For compliance information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document.

### A.4.1 TCC2 Card Specifications

The TCC2 card has the following specifications:

- CTC software
  - Interface: EIA/TIA-232 (local craft access, on TCC2 faceplate)
  - Interface: 10BaseT LAN (on TCC2 faceplate)
  - Interface: 10BaseT LAN (via backplane, access on the MIC-A/P card)
- Synchronization
  - Stratum 3, per ITU-T G.812
  - Free running access: Accuracy +/- 4.6 ppm
  - Holdover stability:  $3.7 * 10 \text{ exp} - 7$  per day including temperature (< 255 slips in first 24 hours)
  - Reference: External BITS, line, internal
- Supply voltage monitoring
  - Both supply voltage inputs are monitored
  - Normal operation:
    - 40.5 to –56.7 V (in –48 VDC systems)
    - 50.0 to –72.0 V (in –60 VDC systems)
  - Undervoltage: Major alarm
  - Overvoltage: Major alarm
- Environmental
  - Operating temperature: –40 to +65 degrees Celsius (–40 to +149 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 26.00 W, 0.54 A at –48 V, 0.43 A at –60 V, 88.8 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.7 kg (1.5 lb)

### A.4.2 TCC2P Card Specifications

The TCC2P card has the following specifications:

- CTC software
  - Interface: EIA/TIA-232 (local craft access, on TCC2P faceplate)
  - Interface: 10BaseT LAN (on TCC2P faceplate)
  - Interface: 10BaseT LAN (via backplane, access on the MIC-A/P card)
- Synchronization
  - Stratum 3, per ITU-T G.812
  - Free running access: Accuracy +/- 4.6 ppm
  - Holdover stability:  $3.7 * 10 \exp - 7$  per day including temperature (< 255 slips in first 24 hours)
  - Reference: External BITS, line, internal
- Supply voltage monitoring
  - Both supply voltage inputs are monitored
  - Normal operation:
    - 40.5 to –56.7 V (in –48 VDC systems)
    - 50.0 to –72.0 V (in –60 VDC systems)
  - Undervoltage: Major alarm
  - Overvoltage: Major alarm
- Environmental
  - Operating temperature: –40 to +65 degrees Celsius (–40 to +149 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 26.00 W, 0.54 A at –48 V, 0.43 A at –60 V, 88.8 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.7 kg (1.5 lb)

## A.4.3 XC10G Card Specifications

The XC10G card has the following specifications:

- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 85%, noncondensing
  - Power consumption: 78.60 W, 1.64 A at –48 V, 268.4 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)

- Depth with backplane connector: 235 mm (9.250 in.)
- Weight not including clam shell: 0.6 kg (1.5 lb)

## A.4.4 XC-VXL-10G Card Specifications

The XC-VXL-10G card has the following specifications:

- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 85%, noncondensing
  - Power consumption: 81.30 W, 1.69 A at -48 V, 277.6 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.6 kg (1.5 lb)

## A.4.5 XC-VXL-2.5G Card Specifications

The XC-VXL-2.5G card has the following specifications:

- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 85%, noncondensing
  - Power consumption: 81.30 W, 1.69 A at -48 V, 277.6 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight, not including clam shell: 0.6 kg (1.5 lb)

## A.4.6 AIC-I Specifications

The AIC-I card has the following specifications:

- Alarm inputs
  - Number of inputs: 16
  - Opto-coupler isolated
  - Label customer provisionable

- Severity customer provisionable
- Common 32-V output for all alarm-inputs
- Each input limited to 2 mA
- Termination via MIC-A/P
- Alarm outputs
  - Number of outputs: 4 (user configurable as inputs)
  - Switched by opto-MOS (metal oxide semiconductor)
  - Triggered by definable alarm condition
  - Maximum allowed open circuit voltage: 60 VDC
  - Maximum allowed closed circuit current: 100 mA
  - Termination via MIC-A/P
- EOW/LOW
  - ITU-T G.711, ITU-T G.712, Telcordia GR-253-CORE
  - A-law, mu-law




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**Note** Due to the nature of mixed coding, in a mixed-mode configuration (A-law/mu-law) the orderwire is not ITU-T G.712 compliant.

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- Orderwire party line
- Dual tone multifrequency (DTMF) signaling
- User data channel (UDC)
  - Bit rate: 64 kbps, codirectional
  - ITU-T G.703
  - Input/output impedance: 120 ohms
  - Termination: RJ-11 connectors
- Generic communications channel (GCC)
  - Bit rate: 576 kbps
  - EIA/TIA-485/V11
  - Input/output impedance: 120 ohms
  - Termination: RJ-45 connectors
- ACC connection for additional alarm interfaces
  - For future use
- Environmental
  - Operating temperature: -40 to +65 degrees Celsius (-40 to +149 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 8.00 W, 0.17 A, 27.3 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)

- Width: 18.2 mm (0.716 in.)
- Depth: 228.6 mm (9.000 in.)
- Card weight: 1.8 lb (0.82 kg)

## A.5 Electrical Card and FMEC Specifications

This section provides specifications for the electrical and FMEC cards.

For compliance information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document.

### A.5.1 E1-N-14 Card Specifications

The E1-N-14 card has the following specifications:

- E1-N-14 input
  - Bit rate: 2.048 Mbps +/-50 ppm
  - Frame format: Unframed, ITU-T G.704 framed
  - Line code: HDB-3
  - Termination: Via FMEC-E1 (for 75 ohms unbalanced) or FMEC-DS1/E1 (for 120 ohms balanced)
  - Input impedance: 75 ohms unbalanced or 120 ohms balanced
  - Cable loss: 0 to 6 dB at 1024 kHz (for cable length, see the specification of the cable that you are using)
  - AIS: ITU-T G.704 compliant
- E1-N-14 output
  - Bit rate: 2.048 Mbps +/-50 ppm
  - Frame format: Unframed, ITU-T G.704 framed
  - Line code: HDB-3
  - Termination: Via FMEC-E1 (for 75 ohms unbalanced) or FMEC-DS1/E1 (for 120 ohms balanced)
  - Output impedance: 75 ohms unbalanced or 120 ohms balanced
  - Alarm indication signal (AIS): ITU-T G.704 compliant
  - Pulse shape: ITU-T G.703, Figure 15
  - Pulse amplitude: 2.37 V +/- 5% zero-peak at 75 ohms; 3 V +/-5% zero-peak at 120 ohms
  - Loopback modes: terminal and facility
- Environmental
  - Overvoltage protection: As in ITU-T G.703 Annex B
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 24.00 W, 0.50 A at -48 V, 81.9 BTU/hr



- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.8 kg (1.9 lb)

## A.5.2 E1-42 Card Specifications

The E1-42 card has the following specifications:

- E1-42 input
  - Bit rate: 2.048 Mbps  $\pm$ 50 ppm
  - Frame format: Unframed, ITU-T G.704 framed
  - Line code: HDB-3
  - Termination: Via FMEC E1-120NP, FMEC E1-120PROA, or FMEC E1-120PROB
  - Input impedance: 120 ohms balanced (75 ohms unbalanced with additional E1-75/120)
  - Cable loss: 0 to 6 dB at 1024 kHz (for cable length, see the specification of the cable that you are using)
  - AIS: ITU-T G.704 compliant
- E1-42 output
  - Bit rate: 2.048 Mbps  $\pm$ 50 ppm
  - Frame format: Unframed, ITU-T G.704 framed
  - Line code: HDB-3
  - Termination: Via FMEC E1-120NP, FMEC E1-120PROA, or FMEC E1-120PROB
  - Output impedance: 120 ohms balanced (75 ohms unbalanced with additional E1-75/120)
  - AIS: ITU-T G.704 compliant
  - Pulse shape: ITU-T G.703, Figure 15
  - Pulse amplitude: 3 V  $\pm$ 5% zero-peak at 120 ohms; 2.37 V  $\pm$ 5% zero-peak at 75 ohms
  - Loopback modes: terminal and facility
- Environmental
  - Overvoltage protection: As in ITU-T G.703 Annex B
  - Operating temperature:  $-5$  to  $+45$  degrees Celsius ( $+23$  to  $+113$  degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 38.10 W, 0.79 A at  $-48$  V, 130.1 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)

- Depth with backplane connector: 235 mm (9.250 in.)
- Weight not including clam shell: 0.8 kg (1.9 lb)

## A.5.3 E3-12 Card Specifications

The E3-12 card has the following specifications:

- E3-12 input
  - Bit rate: 34.368 Mbps +/-20 ppm
  - Line code: HDB-3
  - Termination: Unbalanced coaxial cable
  - Input impedance: 75 ohms +/-5%
  - Cable loss: Up to 12 dB at 17184 kHz (for cable length, see the specification of the cable that you are using)
  - AIS: ITU-T G.704 compliant
- E3-12 output
  - Bit rate: 34.368 Mbps +/- 20 ppm
  - Line code: HDB-3
  - Termination: Unbalanced coaxial cable
  - Output impedance: 75 ohms +/-5%
  - AIS: ITU-T G.704 compliant
  - Power level: -1.8 to +5.7 dBm
  - Pulse shape: ITU-T G.703, Figure 17
  - Pulse amplitude: 0.36 to 0.85 V peak-to-peak
  - Loopback modes: terminal and facility
- E3-12 electrical interface
  - Connectors: 1.0/2.3 miniature coax connectors in the FMEC-E3/DS3 card
- Environmental
  - Overvoltage protection: As in ITU-T G.703 Annex B
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 38.20 W, 0.80 A at -48 V, 130.4 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.7 kg (1.7 lb)

## A.5.4 DS3i-N-12 Card Specifications

The DS3i-N-12 card has the following specifications:

- DS3i-N-12 input
  - Bit rate: 44.736 Mbps  $\pm$ 20 ppm
  - Frame format: ITU-T G.704, ITU-T G.752/DS-3 ANSI T1.107-1988
  - Line code: B3ZS
  - Termination: Unbalanced coaxial cable
  - Input impedance: 75 ohms  $\pm$ 5%
  - Cable loss:
    - Maximum 137 m (450 ft): 734A, RG59, 728A
    - Maximum 24 m (79 ft): RG179
  - AIS: ITU-T G.704 compliant
- DS3i-N-12 output
  - Bit rate: 44.736 Mbps  $\pm$  20 ppm
  - Frame format: ITU-T G.704, ITU-T G.752/DS-3 ANSI T1.107-1988
  - Line code: B3ZS
  - Termination: Unbalanced coaxial cable
  - Output impedance: 75 ohms  $\pm$ 5%
  - AIS: ITU-T G.704 compliant
  - Power level:  $-1.8$  to  $+5.7$  dBm (The power level is for a signal of all ones and is measured at a center frequency of 22.368 MHz (3  $\pm$  1 kHz) bandwidth.)
  - Pulse shape: ITU-T G.703, Figure 14/ANSI T1.102-1988, Figure 8
  - Pulse amplitude: 0.36 to 0.85 V peak-to-peak
  - Loopback modes: terminal and facility
  - Line build out: 0 to 69 m (0 to 225 ft); 69 to 137 m (226 to 450 ft)
- DS3i-N-12 electrical interface
  - Connectors: 1.0/2.3 miniature coax connectors via the FMEC-E3/DS3 card
- Environmental
  - Overvoltage protection: As in ITU-T G.703 Annex B
  - Operating temperature:  $-5$  to  $+45$  degrees Celsius ( $+23$  to  $+113$  degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 26.80 W, 0.56 A at  $-48$  V, 91.5 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)

- Weight not including clam shell: 0.8 kg (1.9 lb)

## A.5.5 STM1E-12 Card Specifications

The STM1E-12 card has the following specifications:

- STM1E-12 input
  - Bit rate: 155.52 Mbps +/-5 ppm for STM-1 or 139.264 Mbps +/-15 ppm for E-4
  - Line code: Coded mark inversion (CMI)
  - E-4 (can be framed or unframed)
  - Termination: Unbalanced coaxial cable
  - Input impedance: 75 ohms +/-5%
  - Cable loss: Up to 12.7 dB at 78 MHz (for cable length, see the specification of the cable that you are using)
  - AIS: ITU-T G.704 compliant
- STM1E-12 output
  - Bit rate: 155.52 Mbps +/-5 ppm for STM-1 or 139.264 Mbps +/-15 ppm for E-4
  - Line code: CMI
  - E-4 can be framed or unframed
  - Termination: Unbalanced coaxial cable
  - Output impedance: 75 ohms +/-5%
  - AIS: ITU-T G.704 compliant
  - Pulse shape: ITU-T G.703, Figure 18 and 19 for E-4, Figure 22 and 23 for STM-1
  - Pulse amplitude: 1 V +/- 0.1 V peak-to-peak
  - Loopback modes: terminal and facility
- STM1E-12 electrical interface
  - Connectors: 1.0/2.3 miniature coax connectors in the FMEC STM1E 1:1 card
- Environmental
  - Overvoltage protection: As in ITU-T G.703 Annex B
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 59.40 W, 1.24 A at -48 V, 202.8 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.7 kg (1.7 lb)

## A.5.6 BLANK Card

The BLANK card has the following specifications:

- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: Not applicable
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Weight not including clam shell: 0.2 kg (0.4 lb)

## A.5.7 FMEC-E1 Specifications

The FMEC-E1 card has the following specifications:

- FMEC-E1 input
  - Bit rate: 2.048 Mbps +/-50 ppm
  - Line code: HDB-3
  - Termination: Unbalanced coaxial cable
  - Input impedance: 75 ohms +/-5%
  - Cable loss: Up to 6 dB at 1024 kHz
- FMEC-E1 output
  - Bit rate: 2.048 Mbps +/-50 ppm
  - Line code: HDB-3
  - Termination: Unbalanced coaxial cable
  - Output impedance: 75 ohms +/-5%
  - Pulse shape: ITU-T G.703, Figure 15 and Table 7
  - Pulse amplitude: ITU-T G.703, Figure 15 and Table 7
- FMEC-E1 electrical interface
  - Connectors: 1.0/2.3 miniature coax connectors
- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 0.00 W, 0.00 A at –48 V, 0.0 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 32 mm (1.25 in.)
  - Depth: 92 mm (3.62 in.)

- Depth with backplane connector: 98 mm (3.87 in.)
- Weight not including clam shell: 0.3 kg (0.7 lb)

## A.5.8 FMEC-DS1/E1 Card Specifications

The FMEC-DS1/E1 card has the following specifications:

- FMEC-DS1/E1 input
  - Bit rate: 2.048 Mbps  $\pm$ 50 ppm
  - Line code: HDB-3
  - Termination: Balanced twisted-pair cable
  - Input impedance: 120 ohms  $\pm$ 5%
  - Cable loss: Up to 6 dB at 1024 kHz
- FMEC-DS1/E1 output
  - Bit rate: 2.048 Mbps  $\pm$ 50 ppm
  - Line code: HDB-3
  - Termination: Balanced twisted-pair cable
  - Output impedance: 120 ohms  $\pm$ 5%
  - Pulse shape: ITU-T G.703, Figure 15 and Table 7
  - Pulse amplitude: ITU-T G.703, Figure 15 and Table 7
- FMEC-DS1/E1 electrical interface
  - Connectors: 37-pin DB connectors
- Environmental
  - Operating temperature:  $-5$  to  $+45$  degrees Celsius ( $+23$  to  $+113$  degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 0.00 W, 0.00 A at  $-48$  V, 0.0 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 32 mm (1.25 in.)
  - Depth: 92 mm (3.62 in.)
  - Depth with backplane connector: 98 mm (3.87 in.)
  - Weight not including clam shell: 0.3 kg (0.6 lb)

## A.5.9 FMEC E1-120NP Card Specifications

The FMEC E1-120NP card has the following specifications:

- FMEC E1-120NP input
  - Bit rate: 2.048 Mbps  $\pm$ 50 ppm
  - Line code: HDB-3

- Termination: Balanced twisted-pair cable
- Input impedance: 120 ohms  $\pm 5\%$
- Cable loss: Up to 6 dB at 1024 kHz
- FMEC E1-120NP output
  - Bit rate: 2.048 Mbps  $\pm 50$  ppm
  - Line code: HDB-3
  - Termination: Balanced twisted-pair cable
  - Input impedance: 120 ohms  $\pm 5\%$
  - Pulse shape: ITU-T G.703, Figure 15 and Table 7
  - Pulse amplitude: ITU-T G.703, Figure 15 and Table 7
- FMEC E1-120NP electrical interface
  - Connectors: Molex 96-pin LFH connectors (21 ports per connector)
- Environmental
  - Operating temperature:  $-5$  to  $+45$  degrees Celsius ( $+23$  to  $+113$  degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 0.00 W, 0.00 A at  $-48$  V, 0.0 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 32 mm (1.25 in.)
  - Depth: 92 mm (3.62 in.)
  - Depth with backplane connector: 98 mm (3.87 in.)
  - Weight not including clam shell: 0.3 kg (0.7 lb)

## A.5.10 FMEC E1-120PROA Card Specifications

The FMEC E1-120PROA card has the following specifications:

- FMEC E1-120PROA input
  - Bit rate: 2.048 Mbps  $\pm 50$  ppm
  - Line code: HDB-3
  - Termination: Balanced twisted-pair cable
  - Input impedance: 120 ohms  $\pm 5\%$
  - Cable loss: Up to 6 dB at 1024 kHz
- FMEC E1-120PROA output
  - Bit rate: 2.048 Mbps  $\pm 50$  ppm
  - Line code: HDB-3
  - Termination: Balanced twisted-pair cable
  - Input impedance: 120 ohms  $\pm 5\%$
  - Pulse shape: ITU-T G.703, Figure 15 and Table 7

- Pulse amplitude: ITU-T G.703, Figure 15 and Table 7
- FMEC E1-120PROA electrical interface
  - Connectors: Molex 96-pin LFH connectors (21 ports per connector)
- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 0.1 W (provided by the E1-42 card), 0.34 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 32 mm (1.25 in.)
  - Depth: 92 mm (3.62 in.)
  - Depth with backplane connector: 98 mm (3.87 in.)
  - Weight not including clam shell: 0.3 kg (0.7 lb)

## A.5.11 FMEC E1-120PROB Card Specifications

The FMEC E1-120PROB card has the following specifications:

- FMEC E1-120PROB input
  - Bit rate: 2.048 Mbps +/-50 ppm
  - Line code: HDB-3
  - Termination: Balanced twisted-pair cable
  - Input impedance: 120 ohms +/-5%
  - Cable loss: Up to 6 dB at 1024 kHz
- FMEC E1-120PROB output
  - Bit rate: 2.048 Mbps +/-50 ppm
  - Line code: HDB-3
  - Termination: Balanced twisted-pair cable
  - Input impedance: 120 ohms +/-5%
  - Pulse shape: ITU-T G.703, Figure 15 and Table 7
  - Pulse amplitude: ITU-T G.703, Figure 15 and Table 7
- FMEC E1-120PROB electrical interface
  - Connectors: Molex 96-pin LFH connectors (21 ports per connector)
- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 0.1 W (provided by the E1-42 card), 0.34 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)



- Width: 32 mm (1.25 in.)
- Depth: 92 mm (3.62 in.)
- Depth with backplane connector: 98 mm (3.87 in.)
- Weight not including clam shell: 0.3 kg (0.7 lb)

## A.5.12 E1-75/120 Impedance Conversion Panel Specifications

The FMEC E1-75/120 impedance conversion panel has the following specifications:

- E1-75/120 input
  - Bit rate: 2.048 Mbps +/-50 ppm
  - Line code: HDB-3
- E1-75/120 output
  - Bit rate: 2.048 Mbps +/-50 ppm
  - Line code: HDB-3
- E1-75/120 electrical interface
  - Connectors:
    - 1.0/2.3 miniature coax connectors on 75-ohm side
    - Molex 96-pin LFH connectors on 120-ohm side
  - Impedance tolerance: +/-5%
- Environmental
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: Not applicable; the E1-75/120 is a passive device.
- Dimensions
  - Height: 75 mm (2.95 in.)
  - Width: 535 mm (21.06 in.)
  - Depth: 221 mm (8.7 in.)
  - Weight: 2.15 kg (4.74 lb)

## A.5.13 FMEC-E3/DS3 Card Specifications

The FMEC-E3/DS3 card has the following specifications:

- FMEC-E3/DS3 input (for E3 signals)
  - Bit rate: 34.368 Mbps +/-20 ppm
  - Line code: HDB-3
  - Termination: Unbalanced coaxial cable
  - Input impedance: 75 ohms +/-5%
  - Cable loss: Up to 12 dB at 17184 kHz

- FMEC-E3/DS3 output (for E3 signals)
  - Bit rate: 34.368 Mbps  $\pm$ 20 ppm
  - Line code: HDB-3
  - Termination: Unbalanced coaxial cable
  - Output impedance: 75 ohms  $\pm$ 5%
  - Pulse shape: ITU-T G.703, Figure 17
  - Pulse amplitude: ITU-T G.703, Figure 17 and Table 9
- FMEC-E3/DS3 Input (for DS3 signals)
  - Bit rate: 44.736 Mbps  $\pm$  20 ppm
  - Line code: B3ZS
  - Termination: Unbalanced coaxial cable
  - Input impedance: 75 ohms  $\pm$ 5%
  - Cable loss:
    - Maximum 137 m (450 ft): 734A, RG59, 728A
    - Max 24 m (79 ft): RG179
- FMEC-E3/DS3 output (for DS3 signals)
  - Bit rate: 44.736 Mbps  $\pm$ 20 ppm
  - Line code: B3ZS
  - Termination: Unbalanced coaxial cable
  - Output impedance: 75 ohms  $\pm$ 5%
  - AIS: TR-TSY-000191 compliant
  - Power level: ITU-T G.703, Table 6;  $-1.8$  to  $+5.7$  dBm
  - Pulse shape: ITU-T G.703, Table 6 and Figure 14; ANSI T1.102-1988, Figure 8
  - Pulse amplitude: ITU-T G.703, Table 6; 0.36 to 0.85 V peak-to-peak
  - Line build out: 0 to 68.58 m (0 to 225 ft.); 68.88 to 137.16 m (226 to 450 ft.)
- FMEC-E3/DS3 electrical interface
  - Connectors: 1.0/2.3 miniature coax connectors
- Environmental
  - Operating temperature:  $-5$  to  $+45$  degrees Celsius ( $+23$  to  $+113$  degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 0.00 W, 0.00 A at  $-48$  V, 0.0 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 32 mm (1.25 in.)
  - Depth: 92 mm (3.62 in.)
  - Depth with backplane connector: 98 mm (3.87 in.)
  - Weight not including clam shell: 0.3 kg (0.7 lb)

## A.5.14 FMEC STM1E 1:1 Card Specifications

The FMEC STM1E 1:1 card has the following specifications:

- FMEC STM1E 1:1 input
  - Bit rate: 155.52 Mbps  $\pm$ 20 ppm
  - Line code: CMI
  - Termination: Unbalanced coaxial cable
  - Input impedance: 75 ohms  $\pm$ 5%
  - Cable loss: Up to 12.7 dB at 78 MHz
- FMEC STM1E 1:1 E4 input
  - Bit rate: 139.264 Mbps  $\pm$ 15 ppm
  - Line code: CMI
  - Termination: Unbalanced coaxial cable
  - Input impedance: 75 ohms  $\pm$ 5%
  - Cable loss: Up to 12.7 dB at 78 MHz
- FMEC STM1E 1:1 output
  - Bit rate: 155.52 Mbps  $\pm$ 20 ppm
  - Line code: CMI
  - Termination: Unbalanced coaxial cable
  - Output impedance: 75 ohms  $\pm$ 5%
  - Pulse shape: ITU-T G.703, Figure 18 and 19 for E-4, Figure 22 and 23 for STM-1
  - Pulse amplitude: 1 V  $\pm$  0.1 V peak-to-peak
- FMEC STM1E E4 output
  - Bit rate: 139.264 Mbps  $\pm$ 20 ppm
  - Line code: CMI
  - Termination: Unbalanced coaxial cable
  - Output impedance: 75 ohms  $\pm$ 5%
  - Pulse shape: ITU-T G.703, Figure 18 and 19 for E-4, Figure 22 and 23 for STM-1
  - Pulse amplitude: 1 V  $\pm$  0.1 V peak-to-peak
- FMEC STM1E 1:1 electrical interface
  - Connectors: 1.0/2.3 miniature coax connectors
- Environmental
  - Operating temperature:  $-5$  to  $+45$  degrees Celsius ( $+23$  to  $+113$  degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 8.8 W (provided by the STM1E-12 card), 30.0 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 32 mm (1.25 in.)

- Depth: 92 mm (3.62 in.)
- Depth with backplane connector: 98 mm (3.87 in.)
- Weight not including clam shell: 0.3 kg (0.7 lb)

## A.5.15 FMEC-BLANK Card Specifications

The FMEC-BLANK card has the following specifications:

- Environmental
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: Not applicable
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 32 mm (1.25 in.)
  - Weight not including clam shell: 0.2 kg (0.4 lb)

## A.5.16 MIC-A/P Card Specifications

The MIC-A/P card has the following specifications:

- Power supply input BATTERY B
  - System supply voltage:  
Nominal -48 VDC  
Tolerance limits: -40.5 to -57.0 VDC
  - Connector: 3WK3 Combo-D power cable connector
- Alarm outputs
  - Voltage (open contact): Maximum 60 VDC
  - Current (closed contact): Maximum 250 mA
  - Connector: 62-pin DB connector (common for inputs/outputs)
- Alarm inputs
  - Voltage (open contact): Maximum 60 VDC
  - Current (closed contact): Maximum 2 mA
  - Connector: 62-pin DB connector (common for inputs/outputs)
- Environmental
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 0.13 W (provided by +5 V from the TCC2/TCC2P card), 0.44 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)

- Width: 32 mm (1.25 in.)
- Depth: 92 mm (3.62 in.)
- Depth with backplane connector: 98 mm (3.87 in.)
- Weight not including clam shell: 0.2 kg (0.5 lb)

## A.5.17 MIC-C/T/P Card Specifications

The MIC-C/T/P card has the following specifications:

- Power supply input BATTERY A
  - System supply voltage:  
Nominal -48 VDC  
Tolerance limits: -40.5 to -57.0 VDC
  - Connector: 3WK3 Combo-D power cable connector
- Timing connector
  - Frequency: 2.048 MHz +/-10 ppm
  - Signal level: 0.75 to 1.5 V
  - Impedance: 75 ohms +/-5% (switchable by jumper to high impedance > 3 kohms)




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**Note** 120 ohms balanced impedance is possible with external matching cable.

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- Cable attenuation: Up to 6 dB at 2 MHz
- Connectors: 1.0/2.3 miniature coax connector
- System management serial port:
  - System management serial port craft interface
  - Modem port (for future use)
  - Connectors: 8-pin RJ-45
- System management LAN port connectors:
  - Signal: IEEE 802.3 10BaseT
  - Connectors: 8-pin RJ-45
- Environmental
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 0.38 W (provided by +5 V from the TCC2/TCC2P card), 1.37 BTU/hr
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 32 mm (1.25 in.)
  - Depth: 92 mm (3.62 in.)
  - Depth with backplane connector: 98 mm (3.87 in.)

- Weight not including clam shell: 0.2 kg (0.5 lb)

## A.6 Optical Card Specifications

This section provides specifications for the optical cards.

For compliance information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document.

### A.6.1 OC3 IR 4/STM1 SH 1310 Card Specifications

The OC3 IR 4/STM1 SH 1310 card has the following specifications:

- Line
  - Bit rate: 155.52 Mbps
  - Code: Scrambled non-return to zero (NRZ)
  - Fiber: 1310-nm single-mode
  - Loopback modes: Terminal and facility
  - Connector: SC
  - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power: –8 dBm
  - Minimum transmitter output power: –15 dBm
  - Center wavelength: 1261 to 1360 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: Fabry Perot laser
  - Extinction ratio: 8.2 dB
  - Dispersion ratio: 96 ps/nm
- Receiver
  - Maximum receiver level: –8 dBm at BER  $1 \times 10^{-12}$
  - Minimum receiver level: –28 dBm at BER  $1 \times 10^{-12}$
  - Receiver: InGaAs/InP photodetector
  - Link loss budget: 13 dB
  - Receiver input wavelength range: 1261 to 1360 nm
  - Jitter tolerance: Telcordia GR-253/ITU-T G.823 compliant
- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 19.20 W, 0.40 A at –48 V, 65.56 BTU/hr
- Dimensions

- Height: 321.3 mm (12.650 in.)
- Width: 18.2 mm (0.716 in.)
- Depth: 228.6 mm (9.000 in.)
- Depth with backplane connector: 235 mm (9.250 in.)
- Weight not including clam shell: 0.4 kg (1.0 lb)

## A.6.2 OC3 IR/STM1 SH 1310-8 Card Specifications

The OC3IR/STM1 SH 1310-8 card has the following specifications:

- Line
  - Bit rate: 155.52 Mbps
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Loopback modes: Terminal and facility
  - Connector: LC
  - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power: -8 dBm
  - Minimum transmitter output power: -15 dBm
  - Center wavelength: 1293 to 1334 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: Fabry Perot laser
  - Extinction ratio: 8.2 dB
  - Dispersion tolerance: 96 ps/nm
- Receiver
  - Maximum receiver level: -8 dBm at BER  $1 * 10^{exp - 12}$
  - Minimum receiver level: -28 dBm at BER  $1 * 10^{exp - 12}$
  - Receiver: InGaAs/InP photodetector
  - Link loss budget: 13 dB
  - Receiver input wavelength range: 1274 to 1356 nm
  - Jitter tolerance: Telcordia GR-253/ITU-T G.823 compliant
- Environmental
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 23.00 W, 0.48 A at -48 V, 78.5 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)

- Depth: 228.6 mm (9.000 in.)
- Depth with backplane connector: 235 mm (9.250 in.)
- Weight not including clam shell: 0.4 kg (1.0 lb)

## A.6.3 OC12 IR/STM4 SH 1310 Card Specifications

The OC12 IR/STM4 SH 1310 card has the following specifications:

- Line
  - Bit rate: 622.08 Mbps
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Loopback modes: Terminal and facility
  - Connectors: SC
  - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power: -8 dBm
  - Minimum transmitter output power: -15 dBm
  - Center wavelength: 1274 to 1356 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: Fabry Perot laser
  - Extinction ratio: 8.2 dB
  - Dispersion tolerance: 96 ps/nm
- Receiver
  - Maximum receiver level: -8 dBm at BER  $1 \times 10^{-12}$
  - Minimum receiver level: -28 dBm at BER  $1 \times 10^{-12}$
  - Receiver: InGaAs/InP photodetector
  - Link loss budget: 13 dB
  - Receiver input wavelength range: 1274 to 1356 nm
  - Jitter tolerance: Telcordia GR-253/ITU-T G.823 compliant
- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 10.90 W, 0.23 A at -48 V, 37.2 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)



- Weight not including clam shell: 0.6 kg (1.4 lb)

## A.6.4 OC12 LR/STM4 LH 1310 Card Specifications

The OC12 LR/STM4 LH 1310 card has the following specifications:

- Line
  - Bit rate: 622.08 Mbps
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Loopback modes: Terminal and facility
  - Connectors: SC
  - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power: +2 dBm
  - Minimum transmitter output power: -3 dBm
  - Center wavelength: 1280 to 1335 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: Distributed feedback (DFB) laser
- Receiver
  - Maximum receiver level: -8 dBm at BER  $1 * 10^{exp - 12}$
  - Minimum receiver level: -28 dBm at BER  $1 * 10^{exp - 12}$
  - Receiver: InGaAs/InP photodetector
  - Link loss budget: 25 dB
  - Receiver input wavelength range: 1280 to 1335 nm
- Environmental
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 9.28 W, 0.19 A at -48 V, 31.7 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.6 kg (1.4 lb)

## A.6.5 OC12 LR/STM4 LH 1550 Card Specifications

The OC12 LR/STM4 LH 1550 card has the following specifications:

- Line
  - Bit rate: 622.08 Mbps
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Loopback modes: Terminal and facility
  - Connectors: SC
  - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power: +2 dBm
  - Minimum transmitter output power: –3 dBm
  - Center wavelength: 1480 to 1580 nm
  - Nominal wavelength: 1550 nm
  - Transmitter: DFB laser
- Receiver
  - Maximum receiver level: –8 dBm at BER  $1 * 10 \text{ exp} - 12$
  - Minimum receiver level: –28 dBm at BER  $1 * 10 \text{ exp} - 12$
  - Receiver: InGaAs/InP photodetector
  - Link loss budget: 25 dB
  - Receiver input wavelength range: 1480 to 1580 nm
- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 9.28 W, 0.19 A at –48 V, 31.7 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.6 kg (1.4 lb)

## A.6.6 OC12 IR/STM4 SH 1310-4 Card Specifications

The OC12 IR/STM4 SH 1310-4 card has the following specifications:

- Line
  - Bit rate: 622.08 Mbps
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode

- Chromatic dispersion allowance: 74 ps/nm for the spectral range of 1274 to 1356 nm;  
46 ps/nm for the spectral range of 1293 to 1334 nm
- Loopback modes: Terminal and facility
- Connector: SC
- Transmitter
  - Maximum transmitter output power: -8 dBm
  - Minimum transmitter output power: -15 dBm
  - Center wavelength: 1293 to 1334 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: Fabry Perot laser
- Receiver
  - Maximum receiver level: -8 dBm at BER  $1 \times 10^{-10}$
  - Minimum receiver level: -30 dBm at BER  $1 \times 10^{-10}$
  - Receiver: InGaAs/InP photodetector
  - Link loss budget: 15 dB
  - Receiver input wavelength range: 1274 to 1356 nm
- Environmental
  - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 28 W, 0.58 A at -48 V, 95.6 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.4 kg (1.0 lb)

## A.6.7 OC48 IR/STM16 SH AS 1310 Card Specifications

The OC48 IR/STM16 SH AS 1310 card has the following specifications:

- Line
  - Bit rate: 2488.320 Mbps
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Loopback modes: Terminal and facility
  - Connectors: SC
  - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter

- Maximum transmitter output power: 0 dBm
- Minimum transmitter output power: –5 dBm
- Center wavelength: 1280 to 1350 nm
- Nominal wavelength: 1310 nm
- Transmitter: DFB laser
- Receiver
  - Maximum receiver level: 0 dBm at BER  $1 * 10 \text{ exp} - 10$
  - Minimum receiver level: –18 dBm at BER  $1 * 10 \text{ exp} - 10$
  - Receiver: InGaAs InP photodetector
  - Link loss budget: 13 dB minimum
  - Receiver input wavelength range: 1280 to 1350 nm
- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 37.20 W, 0.78 A at –48 V, 127.0 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.9 kg (2.2 lb)

## A.6.8 OC48 LR/STM16 LH AS 1550 Card Specifications

The OC48 LR/STM16 LH AS 1550 card has the following specifications:

- Line
  - Bit rate: 2488.320 Mbps
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Loopback modes: Terminal and facility
  - Connectors: SC
  - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power: +3 dBm
  - Minimum transmitter output power: –2 dBm
  - Center wavelength: 1520 to 1580 nm
  - Nominal wavelength: 1550 nm
  - Transmitter: DFB laser

- Receiver
  - Maximum receiver level:  $-8$  dBm at BER  $1 * 10 \text{ exp} - 10$
  - Minimum receiver level:  $-28$  dBm at BER  $1 * 10 \text{ exp} - 10$
  - Receiver: InGaAs avalanche photo diode (APD) photodetector
  - Link loss budget: 26 dB minimum, with 1 dB dispersion penalty
  - Receiver input wavelength range: 1520 to 1580 nm
- Environmental
  - Eye safety compliance: Class 1 (EN60825)
  - Operating temperature:  $-5$  to  $+45$  degrees Celsius ( $+23$  to  $+113$  degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 37.20 W, 0.78 A at  $-48$  V, 127.0 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 0.9 kg (2.2 lb)

## A.6.9 OC48 ELR/STM16 EH 100 GHz Card Specifications

The OC48 ELR/STM16 EH 100 GHz cards have the following specifications:

- Line
  - Bit rate: 2488.320 Mbps
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Loopback modes: Terminal and facility
  - Connectors: SC
  - Compliance: ITU-T G.692, ITU-T G.707, ITU-T G.957, ITU-T G.958
- Transmitter
  - Maximum transmitter output power: 0 dBm
  - Minimum transmitter output power:  $-2$  dBm
  - Center wavelength:  $\pm 0.25$  nm
  - Transmitter: DFB laser
- Receiver
  - Maximum receiver level:  $-8$  dBm at BER  $1 * 10 \text{ exp} - 10$
  - Minimum receiver level:  $-28$  dBm at BER  $1 * 10 \text{ exp} - 10$
  - Receiver: InGaAs APD photodetector
  - Link loss budget: 26 dB minimum, with 1 dB dispersion penalty

- Receiver input wavelength range: 1520 to 1580 nm
- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 31.20 W, 0.65 A at –48 V, 106.5 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 1.1 kg (2.4 lb)
- Currently available wavelengths and versions of the OC48 ELR/STM16 EH 100 GHz card:
  - ITU grid blue band (2 \* 100 GHz spacing):
    - 1530.33 +/- 0.25 nm, STM-16HS-LH 1530.33 (DWDM)
    - 1531.90 +/- 0.25 nm, STM-16HS-LH 1531.90 (DWDM)
    - 1533.47 +/- 0.25 nm, STM-16HS-LH 1533.47 (DWDM)
    - 1535.04 +/- 0.25 nm, STM-16HS-LH 1535.04 (DWDM)
    - 1536.61 +/- 0.25 nm, STM-16HS-LH 1536.61 (DWDM)
    - 1538.19 +/- 0.25 nm, STM-16HS-LH 1538.19 (DWDM)
    - 1539.77 +/- 0.25 nm, STM-16HS-LH 1539.77 (DWDM)
    - 1541.35 +/- 0.25 nm, STM-16HS-LH 1541.35 (DWDM)
    - 1542.94 +/- 0.25 nm, STM-16HS-LH 1542.94 (DWDM)
  - ITU grid red band (2 \* 100 GHz spacing):
    - 1547.72 +/- 0.25 nm, STM-16HS-LH 1547.72 (DWDM)
    - 1549.32 +/- 0.25 nm, STM-16HS-LH 1549.32 (DWDM)
    - 1550.92 +/- 0.25 nm, STM-16HS-LH 1550.92 (DWDM)
    - 1552.52 +/- 0.25 nm, STM-16HS-LH 1552.52 (DWDM)
    - 1554.13 +/- 0.25 nm, STM-16HS-LH 1554.13 (DWDM)
    - 1555.75 +/- 0.25 nm, STM-16HS-LH 1555.75 (DWDM)
    - 1557.36 +/- 0.25 nm, STM-16HS-LH 1557.36 (DWDM)
    - 1558.98 +/- 0.25 nm, STM-16HS-LH 1558.98 (DWDM)
    - 1560.61 +/- 0.25 nm, STM-16HS-LH 1560.61 (DWDM)

## A.6.10 OC192 SR/STM64 IO 1310 Card Specifications

The OC 192 SR/STM64 IO 1310 card has the following specifications:

- Line
  - Bit rate: 9.95328 Gbps

- Code: Scrambled NRZ
- Fiber: 1310-nm single-mode
- Maximum chromatic dispersion allowance: 6.6 ps/nm
- Loopback modes: Terminal and facility
- Connectors: SC
- Compliance: ITU-T G.707, ITU-T G.957, ITU-T G.691
- Transmitter
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: 1290 to 1330 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: Directly modulated laser
- Receiver
  - Maximum receiver level: -1 dBm at BER  $1 * 10^{exp - 12}$
  - Minimum receiver level: -11 dBm at BER  $1 * 10^{exp - 12}$
  - Receiver: PIN diode
  - Link loss budget: 5 dB minimum, plus 1 dB dispersion penalty at BER =  $1 * 10^{exp - 12}$  including dispersion
  - Receiver input wavelength range: 1290 to 1330 nm
- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 47.00 W, 0.98 A at -48 V, 160.5 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 1.3 kg (3.1 lb)

## A.6.11 OC192 IR/STM64 SH 1550 Card Specifications

The OC192 IR/STM64 SH 1550 card has the following specifications:

- Line
  - Bit rate: 9.95328 Gbps
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: 800 ps/nm

- Loopback modes: Terminal and facility

**Note**

You must use a 3 to 15 dB fiber attenuator (5 dB recommended) when working with the OC192 LR/STM64 SH 1550 card in a loopback. Do not use fiber loopbacks with the OC192 LR/STM64 SH 1550 card. Using fiber loopbacks can cause irreparable damage to the OC192 LR/STM64 SH 1550 card.

- Connectors: SC
- Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power: +2 dBm
  - Minimum transmitter output power: -1 dBm
  - Center wavelength: 1530 to 1565 nm
  - Nominal wavelength: 1550 nm
  - Transmitter: Cooled EA (european accreditation) modulated laser
- Receiver
  - Maximum receiver level: -1 dBm at BER  $1 * 10^{exp - 12}$
  - Minimum receiver level: -14 dBm at BER  $1 * 10^{exp - 12}$
  - Receiver: Positive-intrinsic-negative (PIN) diode
  - Link loss budget: 13 dB minimum, plus 2 dB dispersion penalty at BER =  $1 * 10^{exp - 12}$  including dispersion
  - Receiver input wavelength range: 1530 to 1565 nm
- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 50.00 W, 1.04 A at -48 V, 170.7 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 1.3 kg (3.1 lb)

## A.6.12 OC192 LR/STM64 LH 1550 Card Specifications

The OC192 LR/STM64 LH 1550 card has the following specifications:

- Line
  - Bit rate: 9.95328 Gbps
  - Code: Scrambled NRZ



- Fiber: 1550-nm single-mode
- Maximum chromatic dispersion allowance: 1360 ps/nm

**Caution**

You must use a 20 dB fiber attenuator (19 to 24 dB) when working with the OC192 LR/STM64 LH 1550 card in a loopback. Do not use fiber loopbacks with these cards.

- Loopback modes: Terminal and facility
- Connectors: SC
- Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power:
    - +10 dBm (15454E-OC192LR1550);
    - +7 dBm (15454E-L64.2.1)
  - Minimum transmitter output power:
    - +7 dBm (15454E-OC192LR1550);
    - +4 dBm (15454E-L64.2.1)
  - Center wavelength: 1530 to 1565 nm
  - Nominal wavelength: 1550 nm
  - Transmitter: Lithium Niobate (LN) external modulator transmitter
- Receiver
  - Maximum receiver level:
    - 10 dBm (15454E-OC192LR1550);
    - 7 dBm (15454E-L64.2.1)
  - Minimum receiver level:
    - 19 dBm (15454-OC192LR1550);
    - 24 dBm from 1530 to 1565 nm
    - 20 dBm from 1290 to 1330 nm (15454E-L64.2.1)
  - Receiver: APD/TIA
  - Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER =  $1 * 10 \exp - 12$  including dispersion
  - Receiver input wavelength range: 1545 to 1555 nm
- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 72.20 W, 1.50 A, 246.52 BTU/hr (15454E-OC192LR1550); 52.00 W, 1.08 A at -48 V, 177.6 BTU/hr (15454E-L64.2.1)
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)

- Weight not including clam shell: 1.3 kg (3.1 lb)

## A.6.13 OC192 LR/STM64 LH ITU 15xx.xx Card Specifications

The OC192 LR/STM64 LH ITU 15xx.xx card has the following specifications:

- Line
  - Bit rate: 9.95328 Gbps
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance:
    - In deployments with dispersion compensating unit (DCU): +/- 1000 ps/nm, with optical signal-to-noise ratio (OSNR) of 19 dB (0.5 nm resolution bandwidth (RBW))
    - In deployments without DCU: +/- 1200 ps/nm, with ONSR of 23 dB (0.5 nm RBW)
  - Loopback modes: Terminal and facility



### Note

You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the OC192 LR/STM64 LH 15xx.xx card in a loopback. Do not use fiber loopbacks with the OC192 LR/STM64 LH 15xx.xx card. Using fiber loopbacks causes irreparable damage to this card.

- Connectors: SC
- Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +3 dBm
  - Center wavelength: See wavelength plan
  - Center wavelength accuracy: +/- 0.040 nm
  - Transmitter: LN external modulator transmitter
- Receiver
  - Maximum receiver level: -9 dBm at BER  $1 * 10^{exp - 12}$
  - Minimum receiver level: -22 dBm at BER  $1 * 10^{exp - 12}$
  - Receiver: APD
  - Link loss budget: 25 dB minimum, plus 2 dB dispersion penalty at BER =  $1 * 10^{exp - 12}$  including dispersion
  - Receiver input wavelength range: 1529 to 1565 nm
- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 52.00 W, 1.08 A at -48 V, 177.6 BTU/hr
- Dimensions

- Height: 321.3 mm (12.650 in.)
- Width: 18.2 mm (0.716 in.)
- Depth: 228.6 mm (9.000 in.)
- Depth with backplane connector: 235 mm (9.250 in.)
- Weight not including clam shell: 1.3 kg (3.1 lb)
- Currently available wavelengths and versions of OC192 LR/STM64 LH ITU 15xx.xx card:
  - ITU grid blue band:
    - 1534.25 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1534.25
    - 1535.04 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1535.04
    - 1535.82 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1535.82
    - 1536.61 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1536.61
    - 1538.19 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1538.19
    - 1538.98 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1538.98
    - 1539.77 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1539.77
    - 1540.56 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1540.56
  - ITU grid red band:
    - 1550.12 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1550.12
    - 1550.92 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1550.92
    - 1551.72 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1551.72
    - 1552.52 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1552.52
    - 1554.13 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1554.13
    - 1554.94 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1554.94
    - 1555.75 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1555.75
    - 1556.55 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1556.55

## A.7 Ethernet Card Specifications

This section includes specifications for the Ethernet cards.

For compliance information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document.

### A.7.1 E100T-G Card Specifications

The E100T-G card has the following specifications:

- Environmental
  - Operating temperature:
    - C-Temp (15454-E100T-G): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing

- Power consumption: 65 W, 1.35 A, 221.93 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Card weight: 2.3 lb (1.0 kg)
- Compliance
  - ONS 15454 SDH cards, when installed in a system, comply with these safety standards: UL 1950, CSA C22.2 No. 950, EN 60950, IEC 60950

## A.7.2 E1000-2-G Card Specifications

The E1000-2-G card has the following specifications:

- Environmental
  - Operating temperature:  
C-Temp (15454-E1000-2-G): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 53.50 W, 1.11 A, 182.67 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Card weight: 2.1 lb (0.9 kg)
- Compliance
  - ONS 15454 SDH cards, when installed in a system, comply with these safety standards: UL 1950, CSA C22.2 No. 950, EN 60950, IEC 60950
  - Eye Safety Compliance: Class I (21 CFR 1040.10 and 1040.11) and Class 1M (IEC 60825-1 2001-01) laser products

## A.7.3 G1000-4 Card Specifications

The G1000-4 card has the following specifications:

- Environmental
  - Operating temperature:  
C-Temp (15454-G1000-4): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 63.00 W, 1.31 A, 215.11 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)

- Width: 18.2 mm (0.716 in.)
- Depth: 228.6 mm (9.000 in.)
- Card weight: 2.1 lb (0.9 kg)

## A.7.4 G1K-4 Card Specifications

The G1K-4 card has the following specifications:

- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 63.00 W, 1.31 A at -48 V, 215.1 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 2.1 lb (0.9 kg)
- Compliance. ONS 15454 SDH optical cards, when installed in a system, comply with these standards:
  - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, AS/NZS 3260, IEC 60825-1, IEC 60825-2, 21 CFR 1040-10, and 21 CFR 1040.11
  - Class 1 laser product

## A.7.5 ML100T-12 Card Specifications

The ML100T-12 card has the following specifications:

- Environmental
  - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 53.00 W, 1.10 A at -48 V, 181.0 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 2.3 lb (1.0 kg)
- Compliance. ONS 15454 SDH cards, when installed in a system, comply with these standards:
  - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, and AS/NZS 3260

## A.7.6 ML1000-2 Card Specifications

The ML1000-2 card has the following specifications:

- Environmental
  - Operating temperature: –5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 49.00 W, 1.02 A at –48 V, 167.3 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight not including clam shell: 2.1 lb (0.9 kg)
- Compliance. ONS 15454 SDH optical cards, when installed in a system, comply with these standards:
  - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, AS/NZS 3260, IEC 60825-1, IEC 60825-2, 21 CFR 1040-10, and 21 CFR 1040.11
  - Class 1 laser product

## A.8 Storage Access Networking Card Specifications

This section provides specifications for the FC\_MR-4 (Fibre Channel) card.

For compliance information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document.

### A.8.1 FC\_MR-4 Card Specifications

- Environmental
  - Operating temperature
    - C-Temp (15454-E100T): –5 to +55 degrees Celsius (23 to 131 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 60 W, 1.35 A, 221.93 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Card weight: 1.17 kg (2.59 lb)



## Administrative and Service States

This appendix describes the administrative and service states for Cisco ONS 15454 SDH cards, ports, and cross-connects. For circuit state information, see [Chapter 10, “Circuits and Tunnels.”](#) Software Release 5.0 states are based on the generic state model defined in Telcordia GR-1093-CORE, Issue 2 and ITU-T X.731.

### B.1 Service States

Service states include a Primary State (PST), a Primary State Qualifier (PSTQ), and one or more Secondary States (SST). [Table B-1](#) lists the service state PSTs and PSTQs supported by the ONS 15454 SDH.

**Table B-1** ONS 15454 SDH Service State Primary States and Primary State Qualifiers

Primary State, Primary State Qualifier	Definition
Unlocked-enabled	The entity is fully operational and will perform as provisioned.
Unlocked-disabled	The entity is not operational because of an autonomous event.
Locked-disabled	The entity is not operational because of an autonomous event and has also been manually removed from service.
Locked-enabled	The entity has been manually removed from service.

[Table B-2](#) defines the SSTs supported by the ONS 15454 SDH.

**Table B-2** ONS 15454 SDH Secondary States

Secondary State	Definition
automaticInService	The entity is delayed before transitioning to the Unlocked-enabled service state. The transition to Unlocked-enabled state depends on correction of conditions, or on a soak timer. Alarm reporting is suppressed, but traffic is carried. Raised fault conditions, whether or not their alarms are reported, can be retrieved on the CTC Conditions tab or by using the TL1 RTRV-COND command.
disabled	The entity was manually removed from service and does not provide its provisioned functions. All services are disrupted; the entity is unable to carry traffic.

**Table B-2** ONS 15454 SDH Secondary States (continued)

Secondary State	Definition
loopback	The entity is in loopback mode.
mismatchOfEquipment	An improper card is installed, a cross-connect card does not support an installed card, or an incompatible backplane is installed. For example, an installed card is not compatible with the card preprovisioning or the slot. This SST applies only to cards.
maintenance	The entity has been manually removed from service for a maintenance activity but still performs its provisioned functions. Alarm reporting is suppressed, but traffic is carried. Raised fault conditions, whether or not their alarms are reported, can be retrieved on the CTC Conditions tab or by using the TL1 RTRV-COND command.
outOfGroup	The virtual concatenation (VCAT) member cross-connect is not used to carry VCAT group traffic. This state is used to put a member circuit out of the group and to stop sending traffic. Locked-enabled,outOfGroup only applies to the cross-connects on an end node where VCAT resides. The cross-connects on intermediate nodes are in the Locked-enabled,maintenance service state.
softwareDownload	The card is involved in a software download. This SST applies only to cards.
unassigned	The card is not provisioned in the database. This SST applies only to cards.
notInstalled	The card is not physically present (that is, an empty slot). This SST applies only to cards.

## B.2 Administrative States

Administrative states are used to manage service states. Administrative states consist of a PST and an SST. [Table B-3](#) lists the administrative states supported by the ONS 15454 SDH. See [Table B-2](#) for SST definitions.



### Note

A change in the administrative state of an entity does not change the service state of supporting or supported entities.

**Table B-3** ONS 15454 SDH Administrative States

Administrative State (PST,SST)	Definition
Unlocked	Puts the entity in service.
Unlocked,automaticInservice	Puts the entity in automatic in-service.
Locked,disabled	Removes the entity from service and disables it.
Locked,maintenance	Removes the entity from service for maintenance.
Locked,outOfGroup	(VCAT circuits only.) Removes a VCAT member cross-connect from service and from the group of members.



## B.3 Service State Transitions

This section describes the transition from one service state to the next for cards, ports, and cross-connects. A service state transition is based on the action performed on the entity.

### B.3.1 Card Service State Transitions

Table B-4 lists card service state transitions.

**Table B-4** ONS 15454 SDH Card Service State Transitions

Current Service State	Action	Next Service State
Unlocked-enabled	Change the administrative state to Locked,maintenance.	Locked-enabled,maintenance
	Delete the card.	Locked-disabled,unassigned
	Pull the card.	Unlocked-disabled,notInstalled
	Reset the card.	Unlocked-disabled,softwareDownload
Unlocked-disabled,automaticInService and mismatchOfEquipment	Pull the card.	Unlocked-disabled,automaticInService & notInstalled
	Delete the card.	Locked-disabled,unassigned if the card is valid Locked-disabled,mismatchOfEquipment & unassigned if the card is invalid
Unlocked-disabled,automaticInService & softwareDownload	Restart completed.	Unlocked-enabled
	Pull the card.	Unlocked-disabled,automaticInService & notInstalled
Unlocked-disabled,automaticInService & notInstalled	Insert a valid card.	Unlocked-disabled,automaticInService & softwareDownload
	Insert an invalid card.	Unlocked-disabled,automaticInService & mismatchOfEquipment
	Delete the card.	Locked-disabled,unassigned & notInstalled
Unlocked-disabled,mismatchOfEquipment	Pull the card.	Unlocked-disabled,notInstalled
	Delete the card.	Locked-disabled,unassigned if the card is valid Locked-disabled,mismatchOfEquipment & unassigned if the card is invalid
	Change the administrative state to Locked,maintenance.	Locked-disabled,maintenance & notInstalled
Unlocked-disabled,softwareDownload	Restart completed.	Unlocked-enabled
	Pull the card.	Unlocked-disabled,notInstalled

Table B-4 ONS 15454 SDH Card Service State Transitions (continued)

Current Service State	Action	Next Service State
Unlocked-disabled,notInstalled	Insert a valid card.	Unlocked-disabled,softwareDownload
	Insert an invalid card.	Unlocked-disabled,mismatchOfEquipment
	Delete the card.	Locked-disabled,unassigned & notInstalled
	Change the administrative state to Locked,maintenance.	Locked-disabled,maintenance & notInstalled
Locked-disabled,mismatchOfEquipment & maintenance	Change the administrative state to Unlocked.	Unlocked-disabled,mismatchOfEquipment
	Pull the card.	Locked-disabled,maintenance & notInstalled
	Delete the card.	Locked-disabled,unassigned if the card is valid Locked-disabled,mismatchOfEquipment & unassigned if the card is invalid
Locked-disabled,mismatchOfEquipment & unassigned	Pull the card.	Locked-disabled,unassigned & notInstalled
	Provision the card.	Unlocked-disabled,mismatchOfEquipment
Locked-disabled,maintenance & softwareDownload	Restart completed.	Locked-enabled,maintenance
	Pull the card.	Locked-disabled,maintenance & notInstalled
Locked-disabled,maintenance & notInstalled	Change the administrative state to Unlocked.	Unlocked-disabled,notInstalled
	Insert a valid card.	Locked-disabled,maintenance & softwareDownload
	Insert an invalid card.	Locked-disabled,mismatchOfEquipment & maintenance
	Delete the card.	Locked-disabled,unassigned & notInstalled
Locked-disabled,unassigned	Pull the card.	Locked-disabled,unassigned & notInstalled
	Provision an invalid card.	Unlocked-disabled,mismatchOfEquipment
	Provision a valid card.	Unlocked-disabled,softwareDownload
Locked-disabled,unassigned & notInstalled	Insert a valid card.	Unlocked-disabled,softwareDownload
	Insert an invalid card.	Locked-disabled,mismatchOfEquipment & unassigned
	Preprovision a card.	Unlocked-disabled,automaticInService & notInstalled
Locked-enabled,maintenance	Change the administrative state to Unlocked.	Unlocked-enabled
	Delete the card.	Locked-disabled,unassigned
	Pull the card.	Locked-disabled,maintenance & notInstalled
	Reset the card.	Locked-disabled,maintenance & softwareDownloadunassigned

## B.3.2 Port and Cross-Connect Service State Transitions

Table B-5 lists the port and cross-connect service state transitions. Port states do not impact cross-connect states with one exception. A cross-connect in the Unlocked-disabled,automaticInService service state cannot transition autonomously into the Unlocked-enabled service state until the parent port is Unlocked-enabled.

The following ports do not support all of the service states listed in Table B-5:

- E-Series Ethernet ports do not support service states; these ports are either enabled or disabled.
- FC\_MR-4 ports support the Unlocked-enabled; Locked-enabled,disabled; and Locked-enabled,maintenance service states; they do not support the Unlocked-disabled,automaticInService service state.

**Table B-5** ONS 15454 SDH Port and Cross-Connect Service State Transitions

Current Service State	Action	Next Service State
Unlocked-enabled	Put the port or cross-connect in the Locked,maintenance administrative state.	Locked-enabled,maintenance
	Put the port or cross-connect in the Locked,disabled administrative state.	Locked-enabled,disabled Locked-enabled,disabled & outOfGroup for a VCAT cross-connect
	Put the port or cross-connect in the Unlocked,automaticInService administrative state.	Unlocked-disabled,automaticInService <sup>1</sup>
	Put the VCAT cross-connect in the Locked,outOfGroup administrative state.	Locked-enabled,maintenance & outOfGroup
Unlocked-disabled,automaticInService	Put the port or cross-connect in the Unlocked administrative state.	Unlocked-enabled
	Put the port or cross-connect in the Locked,maintenance administrative state.	Locked-enabled,maintenance
	Put the port or cross-connect in the Locked,disabled.	Locked-enabled,disabled Locked-enabled,disabled & outOfGroup for a VCAT cross-connect
	Put the VCAT cross-connect in the Locked,outOfGroup administrative state.	Locked-enabled,maintenance and outOfGroup

Table B-5 ONS 15454 SDH Port and Cross-Connect Service State Transitions (continued)

Current Service State	Action	Next Service State
Locked-enabled,disabled	Put the port or cross-connect in the Unlocked administrative state.	Unlocked-enabled
	Put the port or cross-connect in the Unlocked,automaticInService administrative state.	Unlocked-disabled,automaticInService
	Put the port or cross-connect in the Locked,maintenance.	Locked-enabled,maintenance
	Put the VCAT cross-connect in the Locked,outOfGroup administrative state.	Locked-enabled,maintenance & outOfGroup
Locked-enabled,loopback & maintenance	Release the loopback. <b>Note</b> While in Locked-enabled, loopback & maintenance, both CTC and TL1 allow a cross-connect to be deleted, which also removes the loopback. This applies only to the cross-connect, not the ports.	Locked-enabled,maintenance
Locked-enabled,maintenance	Put the port or cross-connect in the Unlocked administrative state.	Unlocked-enabled
	Put the port or cross-connect in the Unlocked,automaticInService administrative state.	Unlocked-disabled,automaticInService
	Put the port or cross-connect in the Locked,disabled.	Locked-enabled,disabled Locked-enabled,disabled & outOfGroup for a VCAT cross-connect
	Put the port or cross-connect in loopback.	Locked-enabled,loopback & maintenance
	Put the VCAT cross-connect in the Locked,outOfGroup administrative state.	Locked-enabled,maintenance & outOfGroup

- For a VCAT member, an Unlocked-enabled to Unlocked-disabled,automaticInService transition will not occur with a Loss of Multiframe (LOM) or Sequence Mismatch (SQM) condition on the member.



## Network Element Defaults

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This appendix describes the factory-configured (default) network element (NE) settings for the Cisco ONS 15454 SDH. It includes descriptions of card, node, and CTC default settings. To import, export, or edit the settings, refer to the “Maintain the Node” chapter of the *Cisco ONS 15454 SDH Procedure Guide*. Cards supported by this platform that are not listed in this appendix are not supported by factory-configured NE default settings.

To change card settings individually (that is, without changing the defaults), refer to the “Change Card Settings” chapter of the *Cisco ONS 15454 SDH Procedure Guide*. To change node settings, refer to the “Change Node Settings” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

### C.1 Network Element Defaults Description

The NE defaults are pre-installed on each Cisco ONS 15454 SDH TCC2 or TCC2P card. They also ship as a file called 15454SDH-defaults.txt on the CTC software CD in the event you want to import the defaults onto existing TCC2 cards. The NE defaults include card-level, CTC, and node-level defaults.

Changes made manually using the “Change Card Settings” chapter in the *Cisco ONS 15454 SDH Procedure Guide* override default settings. If you use the Defaults Editor or import a new defaults file, the default changes do not change the settings for cards that are currently installed or slots that are pre-provisioned for cards.

Changes made manually to most node-level default settings (either when you initially turn up a node or change node settings later) override the current settings, whether default or provisioned. If you change the default settings, using either the Defaults Editor or by importing a new defaults file, the new defaults take effect immediately for all settings except those relating to protection (SNCP, MS-SPRing, Linear, etc.).



**Note**

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Changing the IIOP listener port in the NE defaults requires a reboot of the node in order for the default change to occur. Use caution when changing this default setting.

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### C.2 Card Default Settings

The tables in this section list the default settings for each card. Cisco provides settings that are pre-provisioned for the Cisco ONS 15454 SDH optical and electrical cards, including:

- Soak Time (all cards) is the length of time that elapses between an AINS port receiving a valid signal and when it automatically changes to in-service status.

- Line Coding (E1-42 cards) defines the E-1 transmission coding type that is used.
- Line Length (DS3i) defines the distance (in feet) from the FMEC connection to the next termination point.
- Line Type (E1, E1-42, and DS3i cards) defines the type of framing used.
- Port State (all cards) sets the port to one of the four available states (IS, OOS, OOS\_MT, or OOS\_AINS), depending on whether you need ports in or out of service.
- SF BER Level (STM-N, TXP, and MXP cards) defines the signal fail bit error rate.
- SD BER Level (STM-N, TXP, and MXP cards) defines the signal degrade bit error rate.
- Enable Sync Messages (STM-N and MXP cards) enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.
- PJ VC4 Mon (STM-N cards) sets the VC4 that will be used for pointer justification. If set to 0, no VC4 is monitored.
- VC4 IPPM Enabled (STM-N cards) enables intermediate-path performance monitoring on a node for transparent monitoring of a channel that does not terminate on that node.
- Send Do Not Use (STM-N, TXP, and MXP cards) sends a DUS message on the S1 byte when enabled.
- Far End Inhibit Loopback (DS3i card) enables DS3i cards to inhibit loopbacks on the far end.
- Payload Type (TXP and MXP cards) defines the type of client signal.
- Termination Mode (TXP and MXP cards) defines the type of termination (line, section, or transparent).
- ALS Mode (TXP and MXP cards) sets the automatic laser shutdown feature to one of four available states (disabled, auto restart, manual restart, manual restart for test).
- ALS Recovery Interval (TXP and MXP cards) sets the automatic laser shutdown recovery time interval.
- ALS Recovery Pulse Width (TXP and MXP cards) set the automatic laser shutdown recovery pulse signal width.
- FEC (TXP and MXP cards) enables or disables the FEC monitoring on the optical transport network.
- G.709 OTN (TXP and MXP cards) enables or disables the G.709 monitoring on the optical transport network.
- FEC Thresholds (TXP and MXP cards) set the performance monitoring parameters for gathering FEC performance data and detecting problems early.
- Optical Thresholds (TXP and MXP cards) set the performance monitoring parameters for gathering physical optics performance data and detecting problems early.
- OTN Thresholds (TXP and MXP cards) set the performance monitoring parameters for gathering OTN trunk-side performance data and detecting problems early.
- PM Threshold Settings (all cards) set the performance monitoring parameters for gathering performance data and detecting problems early.

**Note**


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For more information about the performance monitoring parameters, refer to the “Performance Monitoring” chapter in the *Cisco ONS 15454 SDH Troubleshooting Guide*.

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## C.2.1 E1 Card Default Settings

Table C-1 lists the E1 Card default settings.

**Table C-1 E1 Card Default Settings**

Default Name	Default Value	Minimum	Maximum
E1.config.AINSSoakTime	0.333333333333		
E1.config.LineType	E1_MF		
E1.config.SDBER	1e-007		
E1.config.SFBER	0.0001		
E1.config.State	unlocked, automaticInService		
E1.pmthresholds.line.nearend.15min.CV	9	0	1388700
E1.pmthresholds.line.nearend.15min.ES	65	0	900
E1.pmthresholds.line.nearend.15min.LOSS	0	0	900
E1.pmthresholds.line.nearend.15min.SES	10	0	900
E1.pmthresholds.line.nearend.1day.CV	90	0	133315200
E1.pmthresholds.line.nearend.1day.ES	648	0	86400
E1.pmthresholds.line.nearend.1day.LOSS	0	0	900
E1.pmthresholds.line.nearend.1day.SES	100	0	86400
E1.pmthresholds.path.farend.15min.BBE	0	0	287100
E1.pmthresholds.path.farend.15min.EB	0	0	450000
E1.pmthresholds.path.farend.15min.ES	0	0	900
E1.pmthresholds.path.farend.15min.SES	0	0	900
E1.pmthresholds.path.farend.15min.UAS	0	0	900
E1.pmthresholds.path.farend.1day.BBE	0	0	27561600
E1.pmthresholds.path.farend.1day.EB	0	0	450000
E1.pmthresholds.path.farend.1day.ES	0	0	86400
E1.pmthresholds.path.farend.1day.SES	0	0	86400
E1.pmthresholds.path.farend.1day.UAS	0	0	86400
E1.pmthresholds.path.nearend.15min.BBE	9	0	287100
E1.pmthresholds.path.nearend.15min.EB	9	0	450000
E1.pmthresholds.path.nearend.15min.ES	65	0	900
E1.pmthresholds.path.nearend.15min.SES	10	0	900
E1.pmthresholds.path.nearend.15min.UAS	10	0	900
E1.pmthresholds.path.nearend.1day.BBE	90	0	27561600
E1.pmthresholds.path.nearend.1day.EB	90	0	43200000
E1.pmthresholds.path.nearend.1day.ES	648	0	86400
E1.pmthresholds.path.nearend.1day.SES	100	0	86400
E1.pmthresholds.path.nearend.1day.UAS	10	0	86400

**Table C-1** E1 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
E1.pmthresholds.vclo.farend.15min.BBE	15	0	539100
E1.pmthresholds.vclo.farend.15min.EB	18	0	1800000
E1.pmthresholds.vclo.farend.15min.ES	65	0	900
E1.pmthresholds.vclo.farend.15min.SES	10	0	900
E1.pmthresholds.vclo.farend.15min.UAS	10	0	900
E1.pmthresholds.vclo.farend.1day.BBE	150	0	51753600
E1.pmthresholds.vclo.farend.1day.EB	180	0	172800000
E1.pmthresholds.vclo.farend.1day.ES	648	0	86400
E1.pmthresholds.vclo.farend.1day.SES	100	0	86400
E1.pmthresholds.vclo.farend.1day.UAS	10	0	86400
E1.pmthresholds.vclo.nearend.15min.BBE	15	0	539100
E1.pmthresholds.vclo.nearend.15min.EB	18	0	1800000
E1.pmthresholds.vclo.nearend.15min.ES	65	0	900
E1.pmthresholds.vclo.nearend.15min.SES	10	0	900
E1.pmthresholds.vclo.nearend.15min.UAS	10	0	900
E1.pmthresholds.vclo.nearend.1day.BBE	150	0	51753600
E1.pmthresholds.vclo.nearend.1day.EB	180	0	172800000
E1.pmthresholds.vclo.nearend.1day.ES	648	0	86400
E1.pmthresholds.vclo.nearend.1day.SES	100	0	86400
E1.pmthresholds.vclo.nearend.1day.UAS	10	0	86400

## C.2.2 E1-42 Card Default Settings

Table C-2 lists the E1-42 card default settings.

**Table C-2** E1-42 Card Default Settings

Default Name	Default Value	Minimum	Maximum
E1_42.config.AINSSoakTime	0.333333333333		
E1_42.config.LineCoding	HDB3		
E1_42.config.LineType	E1_MF		
E1_42.config.SDBER	1e-007		
E1_42.config.SFBER	0.0001		
E1_42.config.State	unlocked, automaticInService		
E1_42.pmthresholds.line.nearend.15min.CV	9	0	1388700
E1_42.pmthresholds.line.nearend.15min.ES	65	0	900
E1_42.pmthresholds.line.nearend.15min.LOSS	0	0	900



Table C-2 E1-42 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
E1_42.pmthresholds.line.nearend.15min.SES	10	0	900
E1_42.pmthresholds.line.nearend.1day.CV	90	0	133315200
E1_42.pmthresholds.line.nearend.1day.ES	648	0	86400
E1_42.pmthresholds.line.nearend.1day.LOSS	0	0	900
E1_42.pmthresholds.line.nearend.1day.SES	100	0	86400
E1_42.pmthresholds.path.farend.15min.BBE	0	0	287100
E1_42.pmthresholds.path.farend.15min.EB	0	0	450000
E1_42.pmthresholds.path.farend.15min.ES	0	0	900
E1_42.pmthresholds.path.farend.15min.SES	0	0	900
E1_42.pmthresholds.path.farend.15min.UAS	0	0	900
E1_42.pmthresholds.path.farend.1day.BBE	0	0	27561600
E1_42.pmthresholds.path.farend.1day.EB	0	0	450000
E1_42.pmthresholds.path.farend.1day.ES	0	0	86400
E1_42.pmthresholds.path.farend.1day.SES	0	0	86400
E1_42.pmthresholds.path.farend.1day.UAS	0	0	86400
E1_42.pmthresholds.path.nearend.15min.BBE	9	0	287100
E1_42.pmthresholds.path.nearend.15min.EB	9	0	450000
E1_42.pmthresholds.path.nearend.15min.ES	65	0	900
E1_42.pmthresholds.path.nearend.15min.SES	10	0	900
E1_42.pmthresholds.path.nearend.15min.UAS	10	0	900
E1_42.pmthresholds.path.nearend.1day.BBE	90	0	27561600
E1_42.pmthresholds.path.nearend.1day.EB	90	0	43200000
E1_42.pmthresholds.path.nearend.1day.ES	648	0	86400
E1_42.pmthresholds.path.nearend.1day.SES	100	0	86400
E1_42.pmthresholds.path.nearend.1day.UAS	10	0	86400
E1_42.pmthresholds.vclo.farend.15min.BBE	15	0	539100
E1_42.pmthresholds.vclo.farend.15min.EB	18	0	1800000
E1_42.pmthresholds.vclo.farend.15min.ES	65	0	900
E1_42.pmthresholds.vclo.farend.15min.SES	10	0	900
E1_42.pmthresholds.vclo.farend.15min.UAS	10	0	900
E1_42.pmthresholds.vclo.farend.1day.BBE	150	0	51753600
E1_42.pmthresholds.vclo.farend.1day.EB	180	0	172800000
E1_42.pmthresholds.vclo.farend.1day.ES	648	0	86400
E1_42.pmthresholds.vclo.farend.1day.SES	100	0	86400
E1_42.pmthresholds.vclo.farend.1day.UAS	10	0	86400
E1_42.pmthresholds.vclo.nearend.15min.BBE	15	0	539100

**Table C-2** E1-42 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
E1_42.pmthresholds.vclo.nearend.15min.EB	18	0	1800000
E1_42.pmthresholds.vclo.nearend.15min.ES	65	0	900
E1_42.pmthresholds.vclo.nearend.15min.SES	10	0	900
E1_42.pmthresholds.vclo.nearend.15min.UAS	10	0	900
E1_42.pmthresholds.vclo.nearend.1day.BBE	150	0	51753600
E1_42.pmthresholds.vclo.nearend.1day.EB	180	0	172800000
E1_42.pmthresholds.vclo.nearend.1day.ES	648	0	86400
E1_42.pmthresholds.vclo.nearend.1day.SES	100	0	86400
E1_42.pmthresholds.vclo.nearend.1day.UAS	10	0	86400

## C.2.3 E3 Card Default Settings

Table C-3 lists the E3 card default settings.

**Table C-3** E3 Card Default Settings

Default Name	Default Value	Minimum	Maximum
E3.config.AINSSoakTime	0.333333333333		
E3.config.SDBER	1e-007		
E3.config.SFBER	0.0001		
E3.config.State	unlocked, automaticInService		
E3.pmthresholds.line.nearend.15min.CV	387	0	38700
E3.pmthresholds.line.nearend.15min.ES	25	0	900
E3.pmthresholds.line.nearend.15min.LOSS	10	0	900
E3.pmthresholds.line.nearend.15min.SES	4	0	900
E3.pmthresholds.line.nearend.1day.CV	3865	0	3715200
E3.pmthresholds.line.nearend.1day.ES	250	0	86400
E3.pmthresholds.line.nearend.1day.LOSS	10	0	86400
E3.pmthresholds.line.nearend.1day.SES	40	0	86400
E3.pmthresholds.path.nearend.15min.ES	20	0	900
E3.pmthresholds.path.nearend.15min.SES	3	0	900
E3.pmthresholds.path.nearend.15min.UAS	10	0	900
E3.pmthresholds.path.nearend.1day.ES	200	0	86400
E3.pmthresholds.path.nearend.1day.SES	7	0	86400
E3.pmthresholds.path.nearend.1day.UAS	10	0	86400
E3.pmthresholds.vc4.farend.15min.BBE	25	0	2159100
E3.pmthresholds.vc4.farend.15min.EB	15	0	7200000

Table C-3 E3 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
E3.pmthresholds.vc4.farend.15min.ES	12	0	900
E3.pmthresholds.vc4.farend.15min.SES	3	0	900
E3.pmthresholds.vc4.farend.15min.UAS	10	0	900
E3.pmthresholds.vc4.farend.1day.BBE	250	0	207273600
E3.pmthresholds.vc4.farend.1day.EB	125	0	691200000
E3.pmthresholds.vc4.farend.1day.ES	100	0	86400
E3.pmthresholds.vc4.farend.1day.SES	7	0	86400
E3.pmthresholds.vc4.farend.1day.UAS	10	0	86400
E3.pmthresholds.vc4.nearend.15min.BBE	25	0	2159100
E3.pmthresholds.vc4.nearend.15min.EB	15	0	7200000
E3.pmthresholds.vc4.nearend.15min.ES	12	0	900
E3.pmthresholds.vc4.nearend.15min.SES	3	0	900
E3.pmthresholds.vc4.nearend.15min.UAS	10	0	900
E3.pmthresholds.vc4.nearend.1day.BBE	250	0	207273600
E3.pmthresholds.vc4.nearend.1day.EB	125	0	691200000
E3.pmthresholds.vc4.nearend.1day.ES	100	0	86400
E3.pmthresholds.vc4.nearend.1day.SES	7	0	86400
E3.pmthresholds.vc4.nearend.1day.UAS	10	0	86400
E3.pmthresholds.vclo.farend.15min.BBE	15	0	2159100
E3.pmthresholds.vclo.farend.15min.EB	15	0	7200000
E3.pmthresholds.vclo.farend.15min.ES	12	0	900
E3.pmthresholds.vclo.farend.15min.SES	3	0	900
E3.pmthresholds.vclo.farend.15min.UAS	10	0	900
E3.pmthresholds.vclo.farend.1day.BBE	150	0	207273600
E3.pmthresholds.vclo.farend.1day.EB	125	0	691200000
E3.pmthresholds.vclo.farend.1day.ES	100	0	86400
E3.pmthresholds.vclo.farend.1day.SES	7	0	86400
E3.pmthresholds.vclo.farend.1day.UAS	10	0	86400
E3.pmthresholds.vclo.nearend.15min.BBE	15	0	2159100
E3.pmthresholds.vclo.nearend.15min.EB	15	0	7200000
E3.pmthresholds.vclo.nearend.15min.ES	12	0	900
E3.pmthresholds.vclo.nearend.15min.SES	3	0	900
E3.pmthresholds.vclo.nearend.15min.UAS	10	0	900
E3.pmthresholds.vclo.nearend.1day.BBE	150	0	207273600
E3.pmthresholds.vclo.nearend.1day.EB	125	0	691200000
E3.pmthresholds.vclo.nearend.1day.ES	100	0	86400

**Table C-3** E3 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
E3.pmthresholds.vclo.nearend.1day.SES	7	0	86400
E3.pmthresholds.vclo.nearend.1day.UAS	10	0	86400

## C.2.4 FC\_MR-4 Card Default Settings

Table C-4 lists the FC\_MR-4 (fibre channel) card default settings.

**Table C-4** FC-MR Card Default Settings

Default Name	Default Value	Minimum	Maximum
FC-MR.config.card.Mode	Fibre Channel/FICON Enhanced		
FC-MR.config.port.distanceExtension.AutoadjustGFPBufferThreshold	TRUE		
FC-MR.config.port.distanceExtension.AutoDetect	TRUE		
FC-MR.config.port.distanceExtension.Enabled	TRUE		
FC-MR.config.port.distanceExtension.NumCredits	32	2	256
FC-MR.config.port.distanceExtension.NumGFPBuffers	16		
FC-MR.config.port.enhancedFibreChannelFicon.IngressIdleFiltering	TRUE		
FC-MR.config.port.enhancedFibreChannelFicon.MaxFrameSize	2148		
FC-MR.config.port.LinkRecovery	FALSE		
FC-MR.config.port.MediaType	Undefined		
FC-MR.config.port.State	locked, disabled		

## C.2.5 DS3I Card Default Settings

Table C-5 lists the DS3I card default settings.

**Table C-5** DS3I Card Default Settings

Default Name	Default Value	Minimum	Maximum
DS3I.config.AINSSoakTime	0.333333333333		
DS3I.config.FeInhibitLpbk	FALSE		
DS3I.config.LineLength	0 - 225 ft		
DS3I.config.LineType	C BIT		
DS3I.config.SDBER	1e-007		
DS3I.config.SFBER	0.0001		
DS3I.config.State	unlocked, automaticInService		
DS3I.pmthresholds.cpbithpath.farend.15min.CV	382	0	287100

Table C-5 DS3I Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
DS3I.pmthresholds.cpbitpath.farend.15min.ES	25	0	900
DS3I.pmthresholds.cpbitpath.farend.15min.SAS	2	0	900
DS3I.pmthresholds.cpbitpath.farend.15min.SES	4	0	900
DS3I.pmthresholds.cpbitpath.farend.15min.UAS	10	0	900
DS3I.pmthresholds.cpbitpath.farend.1day.CV	3820	0	27561600
DS3I.pmthresholds.cpbitpath.farend.1day.ES	250	0	86400
DS3I.pmthresholds.cpbitpath.farend.1day.SAS	8	0	86400
DS3I.pmthresholds.cpbitpath.farend.1day.SES	40	0	86400
DS3I.pmthresholds.cpbitpath.farend.1day.UAS	10	0	86400
DS3I.pmthresholds.cpbitpath.nearend.15min.CV	382	0	287100
DS3I.pmthresholds.cpbitpath.nearend.15min.ES	25	0	900
DS3I.pmthresholds.cpbitpath.nearend.15min.SES	4	0	900
DS3I.pmthresholds.cpbitpath.nearend.15min.UAS	10	0	900
DS3I.pmthresholds.cpbitpath.nearend.1day.CV	3820	0	27561600
DS3I.pmthresholds.cpbitpath.nearend.1day.ES	250	0	86400
DS3I.pmthresholds.cpbitpath.nearend.1day.SES	40	0	86400
DS3I.pmthresholds.cpbitpath.nearend.1day.UAS	10	0	86400
DS3I.pmthresholds.line.nearend.15min.CV	387	0	38700
DS3I.pmthresholds.line.nearend.15min.ES	25	0	900
DS3I.pmthresholds.line.nearend.15min.LOSS	10	0	900
DS3I.pmthresholds.line.nearend.15min.SES	4	0	900
DS3I.pmthresholds.line.nearend.1day.CV	3865	0	3715200
DS3I.pmthresholds.line.nearend.1day.ES	250	0	86400
DS3I.pmthresholds.line.nearend.1day.LOSS	10	0	86400
DS3I.pmthresholds.line.nearend.1day.SES	40	0	86400
DS3I.pmthresholds.pbitpath.nearend.15min.AISS	10	0	900
DS3I.pmthresholds.pbitpath.nearend.15min.CV	382	0	287100
DS3I.pmthresholds.pbitpath.nearend.15min.ES	25	0	900
DS3I.pmthresholds.pbitpath.nearend.15min.SAS	2	0	900
DS3I.pmthresholds.pbitpath.nearend.15min.SES	4	0	900
DS3I.pmthresholds.pbitpath.nearend.15min.UAS	10	0	900
DS3I.pmthresholds.pbitpath.nearend.1day.AISS	10	0	86400
DS3I.pmthresholds.pbitpath.nearend.1day.CV	3820	0	27561600
DS3I.pmthresholds.pbitpath.nearend.1day.ES	250	0	86400
DS3I.pmthresholds.pbitpath.nearend.1day.SAS	8	0	86400
DS3I.pmthresholds.pbitpath.nearend.1day.SES	40	0	86400

Table C-5 DS3I Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
DS3I.pmthresholds.pbitpath.nearend.1day.UAS	10	0	86400
DS3I.pmthresholds.vc4.farend.15min.BBE	25	0	2159100
DS3I.pmthresholds.vc4.farend.15min.EB	15	0	7200000
DS3I.pmthresholds.vc4.farend.15min.ES	12	0	900
DS3I.pmthresholds.vc4.farend.15min.SES	3	0	900
DS3I.pmthresholds.vc4.farend.15min.UAS	10	0	900
DS3I.pmthresholds.vc4.farend.1day.BBE	250	0	207273600
DS3I.pmthresholds.vc4.farend.1day.EB	125	0	691200000
DS3I.pmthresholds.vc4.farend.1day.ES	100	0	86400
DS3I.pmthresholds.vc4.farend.1day.SES	7	0	86400
DS3I.pmthresholds.vc4.farend.1day.UAS	10	0	86400
DS3I.pmthresholds.vc4.nearend.15min.BBE	25	0	2159100
DS3I.pmthresholds.vc4.nearend.15min.EB	15	0	7200000
DS3I.pmthresholds.vc4.nearend.15min.ES	12	0	900
DS3I.pmthresholds.vc4.nearend.15min.SES	3	0	900
DS3I.pmthresholds.vc4.nearend.15min.UAS	10	0	900
DS3I.pmthresholds.vc4.nearend.1day.BBE	250	0	207273600
DS3I.pmthresholds.vc4.nearend.1day.EB	125	0	691200000
DS3I.pmthresholds.vc4.nearend.1day.ES	100	0	86400
DS3I.pmthresholds.vc4.nearend.1day.SES	7	0	86400
DS3I.pmthresholds.vc4.nearend.1day.UAS	10	0	86400
DS3I.pmthresholds.vclo.farend.15min.BBE	15	0	2159100
DS3I.pmthresholds.vclo.farend.15min.EB	15	0	7200000
DS3I.pmthresholds.vclo.farend.15min.ES	12	0	900
DS3I.pmthresholds.vclo.farend.15min.SES	3	0	900
DS3I.pmthresholds.vclo.farend.15min.UAS	10	0	900
DS3I.pmthresholds.vclo.farend.1day.BBE	150	0	207273600
DS3I.pmthresholds.vclo.farend.1day.EB	125	0	691200000
DS3I.pmthresholds.vclo.farend.1day.ES	100	0	86400
DS3I.pmthresholds.vclo.farend.1day.SES	7	0	86400
DS3I.pmthresholds.vclo.farend.1day.UAS	10	0	86400
DS3I.pmthresholds.vclo.nearend.15min.BBE	15	0	2159100
DS3I.pmthresholds.vclo.nearend.15min.EB	15	0	7200000
DS3I.pmthresholds.vclo.nearend.15min.ES	12	0	900
DS3I.pmthresholds.vclo.nearend.15min.SES	3	0	900
DS3I.pmthresholds.vclo.nearend.15min.UAS	10	0	900

**Table C-5 DS3I Card Default Settings (continued)**

Default Name	Default Value	Minimum	Maximum
DS3I.pmthresholds.vclo.nearend.1day.BBE	150	0	207273600
DS3I.pmthresholds.vclo.nearend.1day.EB	125	0	691200000
DS3I.pmthresholds.vclo.nearend.1day.ES	100	0	86400
DS3I.pmthresholds.vclo.nearend.1day.SES	7	0	86400
DS3I.pmthresholds.vclo.nearend.1day.UAS	10	0	86400

## C.2.6 Data Card Default Settings

Table C-6 lists the G1000-4, ML100T-12, and ML1000-2 card default settings.

**Table C-6 Data Card Default Settings**

Default Name	Default Value
G1000.config.AINSSoakTime	0.333333333333
G1000.config.State	locked, disabled
ML1000.config.card.Mode	HDLC
ML100T.config.card.Mode	HDLC

## C.2.7 STM1 Card Default Settings

Table C-7 lists the STM1 card default settings.

**Table C-7 STM1 Card Default Settings**

Default Name	Default Value	Minimum	Maximum
STM1.config.line.AdminSSMin	STU		
STM1.config.line.AINSSoakTime	0.333333333333		
STM1.config.line.PJVC4Mon#	0	0	1
STM1.config.line.SDBER	1e-007		
STM1.config.line.Send<FF>DoNotUse	FALSE		
STM1.config.line.SendDoNotUse	FALSE		
STM1.config.line.SFBER	0.0001		
STM1.config.line.State	unlocked, automaticInService		
STM1.config.line.SyncMsgIn	TRUE		
STM1.config.vc4.IPPMEnabled	FALSE		
STM1.pmthresholds.ms.farend.15min.BBE	1312	0	137700
STM1.pmthresholds.ms.farend.15min.EB	1312	0	137700
STM1.pmthresholds.ms.farend.15min.ES	87	0	900
STM1.pmthresholds.ms.farend.15min.SES	1	0	900

Table C-7 STM1 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM1.pmthresholds.ms.farend.15min.UAS	3	0	900
STM1.pmthresholds.ms.farend.1day.BBE	13120	0	13219200
STM1.pmthresholds.ms.farend.1day.EB	13120	0	13219200
STM1.pmthresholds.ms.farend.1day.ES	864	0	86400
STM1.pmthresholds.ms.farend.1day.SES	4	0	86400
STM1.pmthresholds.ms.farend.1day.UAS	10	0	86400
STM1.pmthresholds.ms.nearend.15min.BBE	1312	0	137700
STM1.pmthresholds.ms.nearend.15min.EB	1312	0	137700
STM1.pmthresholds.ms.nearend.15min.ES	87	0	900
STM1.pmthresholds.ms.nearend.15min.PSC	1	0	600
STM1.pmthresholds.ms.nearend.15min.PSD	300	0	900
STM1.pmthresholds.ms.nearend.15min.SES	1	0	900
STM1.pmthresholds.ms.nearend.15min.UAS	3	0	900
STM1.pmthresholds.ms.nearend.1day.BBE	13120	0	13219200
STM1.pmthresholds.ms.nearend.1day.EB	13120	0	13219200
STM1.pmthresholds.ms.nearend.1day.ES	864	0	86400
STM1.pmthresholds.ms.nearend.1day.PSC	5	0	57600
STM1.pmthresholds.ms.nearend.1day.PSD	600	0	86400
STM1.pmthresholds.ms.nearend.1day.SES	4	0	86400
STM1.pmthresholds.ms.nearend.1day.UAS	10	0	86400
STM1.pmthresholds.path.farend.15min.BBE	25	0	2159100
STM1.pmthresholds.path.farend.15min.EB	15	0	13305600
STM1.pmthresholds.path.farend.15min.ES	12	0	900
STM1.pmthresholds.path.farend.15min.SES	3	0	900
STM1.pmthresholds.path.farend.15min.UAS	10	0	900
STM1.pmthresholds.path.farend.1day.BBE	250	0	207273600
STM1.pmthresholds.path.farend.1day.EB	125	0	691200000
STM1.pmthresholds.path.farend.1day.ES	100	0	86400
STM1.pmthresholds.path.farend.1day.SES	7	0	86400
STM1.pmthresholds.path.farend.1day.UAS	10	0	86400
STM1.pmthresholds.path.nearend.15min.BBE	25	0	2159100
STM1.pmthresholds.path.nearend.15min.EB	15	0	7200000
STM1.pmthresholds.path.nearend.15min.ES	12	0	900
STM1.pmthresholds.path.nearend.15min.NPJC-PDET	60	0	7200000
STM1.pmthresholds.path.nearend.15min.NPJC-PGEN	60	0	7200000
STM1.pmthresholds.path.nearend.15min.PJCDIFF	60	0	14400000



Table C-7 STM1 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM1.pmthresholds.path.nearend.15min.PJCS-PDET	100	0	900
STM1.pmthresholds.path.nearend.15min.PJCS-PGEN	100	0	900
STM1.pmthresholds.path.nearend.15min.PPJC-PDET	60	0	7200000
STM1.pmthresholds.path.nearend.15min.PPJC-PGEN	60	0	7200000
STM1.pmthresholds.path.nearend.15min.SES	3	0	900
STM1.pmthresholds.path.nearend.15min.UAS	10	0	900
STM1.pmthresholds.path.nearend.1day.BBE	250	0	207273600
STM1.pmthresholds.path.nearend.1day.EB	125	0	691200000
STM1.pmthresholds.path.nearend.1day.ES	100	0	86400
STM1.pmthresholds.path.nearend.1day.NPJC-PDET	5760	0	691200000
STM1.pmthresholds.path.nearend.1day.NPJC-PGEN	5760	0	691200000
STM1.pmthresholds.path.nearend.1day.PJCDIFF	5760	0	1382400000
STM1.pmthresholds.path.nearend.1day.PJCS-PDET	9600	0	86400
STM1.pmthresholds.path.nearend.1day.PJCS-PGEN	9600	0	86400
STM1.pmthresholds.path.nearend.1day.PPJC-PDET	5760	0	691200000
STM1.pmthresholds.path.nearend.1day.PPJC-PGEN	5760	0	691200000
STM1.pmthresholds.path.nearend.1day.SES	7	0	86400
STM1.pmthresholds.path.nearend.1day.UAS	10	0	86400
STM1.pmthresholds.rs.nearend.15min.BBE	10000	0	138600
STM1.pmthresholds.rs.nearend.15min.EB	10000	0	138600
STM1.pmthresholds.rs.nearend.15min.ES	500	0	900
STM1.pmthresholds.rs.nearend.15min.SES	500	0	900
STM1.pmthresholds.rs.nearend.1day.BBE	100000	0	13305600
STM1.pmthresholds.rs.nearend.1day.EB	100000	0	13305600
STM1.pmthresholds.rs.nearend.1day.ES	5000	0	86400
STM1.pmthresholds.rs.nearend.1day.SES	5000	0	86400

## C.2.8 STM1-8 Card Default Settings

Table C-8 lists the STM1-8 card default settings.

Table C-8 STM1-8 Card Default Settings

Default Name	Default Value	Minimum	Maximum
STM1-8.config.line.AdminSSMIn	STU		
STM1-8.config.line.AINSSoakTime	0.333333333333		
STM1-8.config.line.AlsMode	Disabled		

Table C-8 STM1-8 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM1-8.config.line.AlsRecoveryPulseDuration	2		
STM1-8.config.line.AlsRecoveryPulseInterval	100	60	300
STM1-8.config.line.PJVC4Mon#	0	0	1
STM1-8.config.line.SDBER	1e-007		
STM1-8.config.line.Send<FF>DoNotUse	FALSE		
STM1-8.config.line.SendDoNotUse	FALSE		
STM1-8.config.line.SFBER	0.0001		
STM1-8.config.line.State	unlocked, automaticInService		
STM1-8.config.line.SyncMsgIn	TRUE		
STM1-8.config.vc4.IPPMEnabled	FALSE		
STM1-8.pmthresholds.ms.farend.15min.BBE	1312	0	137700
STM1-8.pmthresholds.ms.farend.15min.EB	1312	0	137700
STM1-8.pmthresholds.ms.farend.15min.ES	87	0	900
STM1-8.pmthresholds.ms.farend.15min.SES	1	0	900
STM1-8.pmthresholds.ms.farend.15min.UAS	3	0	900
STM1-8.pmthresholds.ms.farend.1day.BBE	13120	0	13219200
STM1-8.pmthresholds.ms.farend.1day.EB	13120	0	13219200
STM1-8.pmthresholds.ms.farend.1day.ES	864	0	86400
STM1-8.pmthresholds.ms.farend.1day.SES	4	0	86400
STM1-8.pmthresholds.ms.farend.1day.UAS	10	0	86400
STM1-8.pmthresholds.ms.nearend.15min.BBE	1312	0	137700
STM1-8.pmthresholds.ms.nearend.15min.EB	1312	0	137700
STM1-8.pmthresholds.ms.nearend.15min.ES	87	0	900
STM1-8.pmthresholds.ms.nearend.15min.PSC	1	0	600
STM1-8.pmthresholds.ms.nearend.15min.PSD	300	0	900
STM1-8.pmthresholds.ms.nearend.15min.SES	1	0	900
STM1-8.pmthresholds.ms.nearend.15min.UAS	3	0	900
STM1-8.pmthresholds.ms.nearend.1day.BBE	13120	0	13219200
STM1-8.pmthresholds.ms.nearend.1day.EB	13120	0	13219200
STM1-8.pmthresholds.ms.nearend.1day.ES	864	0	86400
STM1-8.pmthresholds.ms.nearend.1day.PSC	5	0	57600
STM1-8.pmthresholds.ms.nearend.1day.PSD	600	0	86400
STM1-8.pmthresholds.ms.nearend.1day.SES	4	0	86400
STM1-8.pmthresholds.ms.nearend.1day.UAS	10	0	86400
STM1-8.pmthresholds.path.farend.15min.BBE	25	0	2159100
STM1-8.pmthresholds.path.farend.15min.EB	15	0	13305600

Table C-8 STM1-8 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM1-8.pmthresholds.path.farend.15min.ES	12	0	900
STM1-8.pmthresholds.path.farend.15min.SES	3	0	900
STM1-8.pmthresholds.path.farend.15min.UAS	10	0	900
STM1-8.pmthresholds.path.farend.1day.BBE	250	0	207273600
STM1-8.pmthresholds.path.farend.1day.EB	125	0	691200000
STM1-8.pmthresholds.path.farend.1day.ES	100	0	86400
STM1-8.pmthresholds.path.farend.1day.SES	7	0	86400
STM1-8.pmthresholds.path.farend.1day.UAS	10	0	86400
STM1-8.pmthresholds.path.nearend.15min.BBE	25	0	2159100
STM1-8.pmthresholds.path.nearend.15min.EB	15	0	7200000
STM1-8.pmthresholds.path.nearend.15min.ES	12	0	900
STM1-8.pmthresholds.path.nearend.15min.NPJC-PDET	60	0	7200000
STM1-8.pmthresholds.path.nearend.15min.NPJC-PGEN	60	0	7200000
STM1-8.pmthresholds.path.nearend.15min.PJCDIFF	60	0	14400000
STM1-8.pmthresholds.path.nearend.15min.PJCS-PDET	100	0	900
STM1-8.pmthresholds.path.nearend.15min.PJCS-PGEN	100	0	900
STM1-8.pmthresholds.path.nearend.15min.PPJC-PDET	60	0	7200000
STM1-8.pmthresholds.path.nearend.15min.PPJC-PGEN	60	0	7200000
STM1-8.pmthresholds.path.nearend.15min.SES	3	0	900
STM1-8.pmthresholds.path.nearend.15min.UAS	10	0	900
STM1-8.pmthresholds.path.nearend.1day.BBE	250	0	207273600
STM1-8.pmthresholds.path.nearend.1day.EB	125	0	691200000
STM1-8.pmthresholds.path.nearend.1day.ES	100	0	86400
STM1-8.pmthresholds.path.nearend.1day.NPJC-PDET	5760	0	691200000
STM1-8.pmthresholds.path.nearend.1day.NPJC-PGEN	5760	0	691200000
STM1-8.pmthresholds.path.nearend.1day.PJCDIFF	5760	0	1382400000
STM1-8.pmthresholds.path.nearend.1day.PJCS-PDET	9600	0	86400
STM1-8.pmthresholds.path.nearend.1day.PJCS-PGEN	9600	0	86400
STM1-8.pmthresholds.path.nearend.1day.PPJC-PDET	5760	0	691200000
STM1-8.pmthresholds.path.nearend.1day.PPJC-PGEN	5760	0	691200000
STM1-8.pmthresholds.path.nearend.1day.SES	7	0	86400
STM1-8.pmthresholds.path.nearend.1day.UAS	10	0	86400
STM1-8.pmthresholds.rs.nearend.15min.BBE	10000	0	138600
STM1-8.pmthresholds.rs.nearend.15min.EB	10000	0	138600
STM1-8.pmthresholds.rs.nearend.15min.ES	500	0	900
STM1-8.pmthresholds.rs.nearend.15min.SES	500	0	900

Table C-8 STM1-8 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM1-8.pmthresholds.rs.nearend.1day.BBE	100000	0	13305600
STM1-8.pmthresholds.rs.nearend.1day.EB	100000	0	13305600
STM1-8.pmthresholds.rs.nearend.1day.ES	5000	0	86400
STM1-8.pmthresholds.rs.nearend.1day.SES	5000	0	86400

## C.2.9 STM1E-12 Card Default Settings

Table C-9 lists the STM1E-12 card default settings.

Table C-9 STM1E-12 Card Default Settings

Default Name	Default Value	Minimum	Maximum
STM1E-12.config.line.AINSSoakTime	0.333333333333		
STM1E-12.config.line.PJVC4Mon#	0		
STM1E-12.config.line.SDBER	1e-007		
STM1E-12.config.line.SendDoNotUse	FALSE		
STM1E-12.config.line.SFBER	0.0001		
STM1E-12.config.line.State	unlocked, automaticInService		
STM1E-12.config.line.SyncMsgIn	TRUE		
STM1E-12.config.vc4.IPPMEnabled	FALSE		
STM1E-12.pmthresholds.ms.farend.15min.stm1.BBE	1312	0	137700
STM1E-12.pmthresholds.ms.farend.15min.stm1.EB	1312	0	137700
STM1E-12.pmthresholds.ms.farend.15min.stm1.ES	87	0	900
STM1E-12.pmthresholds.ms.farend.15min.stm1.SES	1	0	900
STM1E-12.pmthresholds.ms.farend.15min.stm1.UAS	3	0	900
STM1E-12.pmthresholds.ms.farend.1day.stm1.BBE	13120	0	13219200
STM1E-12.pmthresholds.ms.farend.1day.stm1.EB	13120	0	13219200
STM1E-12.pmthresholds.ms.farend.1day.stm1.ES	864	0	86400
STM1E-12.pmthresholds.ms.farend.1day.stm1.SES	4	0	86400
STM1E-12.pmthresholds.ms.farend.1day.stm1.UAS	10	0	86400
STM1E-12.pmthresholds.ms.nearend.15min.e4.BBE	9	0	137700
STM1E-12.pmthresholds.ms.nearend.15min.e4.EB	630	0	137700
STM1E-12.pmthresholds.ms.nearend.15min.e4.ES	65	0	900
STM1E-12.pmthresholds.ms.nearend.15min.e4.SES	10	0	900
STM1E-12.pmthresholds.ms.nearend.15min.e4.UAS	10	0	900
STM1E-12.pmthresholds.ms.nearend.15min.stm1.BBE	1312	0	137700
STM1E-12.pmthresholds.ms.nearend.15min.stm1.EB	1312	0	137700

Table C-9 STM1E-12 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM1E-12.pmthresholds.ms.nearend.15min.stm1.ES	87	0	900
STM1E-12.pmthresholds.ms.nearend.15min.stm1.SES	1	0	900
STM1E-12.pmthresholds.ms.nearend.15min.stm1.UAS	3	0	900
STM1E-12.pmthresholds.ms.nearend.1day.e4.BBE	6300	0	13219200
STM1E-12.pmthresholds.ms.nearend.1day.e4.EB	6300	0	13219200
STM1E-12.pmthresholds.ms.nearend.1day.e4.ES	864	0	86400
STM1E-12.pmthresholds.ms.nearend.1day.e4.SES	100	0	86400
STM1E-12.pmthresholds.ms.nearend.1day.e4.UAS	100	0	86400
STM1E-12.pmthresholds.ms.nearend.1day.stm1.BBE	13120	0	13219200
STM1E-12.pmthresholds.ms.nearend.1day.stm1.EB	13120	0	13219200
STM1E-12.pmthresholds.ms.nearend.1day.stm1.ES	864	0	86400
STM1E-12.pmthresholds.ms.nearend.1day.stm1.SES	4	0	86400
STM1E-12.pmthresholds.ms.nearend.1day.stm1.UAS	10	0	86400
STM1E-12.pmthresholds.path.farend.15min.BBE	25	0	7200000
STM1E-12.pmthresholds.path.farend.15min.EB	15	0	7200000
STM1E-12.pmthresholds.path.farend.15min.ES	12	0	900
STM1E-12.pmthresholds.path.farend.15min.SES	3	0	900
STM1E-12.pmthresholds.path.farend.15min.UAS	10	0	900
STM1E-12.pmthresholds.path.farend.1day.BBE	250	0	207273600
STM1E-12.pmthresholds.path.farend.1day.EB	125	0	691200000
STM1E-12.pmthresholds.path.farend.1day.ES	100	0	86400
STM1E-12.pmthresholds.path.farend.1day.SES	7	0	86400
STM1E-12.pmthresholds.path.farend.1day.UAS	10	0	86400
STM1E-12.pmthresholds.path.nearend.15min.BBE	25	0	2159100
STM1E-12.pmthresholds.path.nearend.15min.EB	15	0	7200000
STM1E-12.pmthresholds.path.nearend.15min.ES	12	0	900
STM1E-12.pmthresholds.path.nearend.15min.SES	3	0	900
STM1E-12.pmthresholds.path.nearend.15min.UAS	10	0	900
STM1E-12.pmthresholds.path.nearend.1day.BBE	250	0	207273600
STM1E-12.pmthresholds.path.nearend.1day.EB	125	0	691200000
STM1E-12.pmthresholds.path.nearend.1day.ES	100	0	86400
STM1E-12.pmthresholds.path.nearend.1day.SES	7	0	86400
STM1E-12.pmthresholds.path.nearend.1day.UAS	10	0	86400
STM1E-12.pmthresholds.rs.nearend.15min.BBE	10000	0	138600
STM1E-12.pmthresholds.rs.nearend.15min.EB	10000	0	138600
STM1E-12.pmthresholds.rs.nearend.15min.ES	500	0	900

Table C-9 STM1E-12 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM1E-12.pmthresholds.rs.nearend.15min.SES	500	0	900
STM1E-12.pmthresholds.rs.nearend.15min.UAS	500	0	900
STM1E-12.pmthresholds.rs.nearend.1day.BBE	100000	0	13305600
STM1E-12.pmthresholds.rs.nearend.1day.EB	100000	0	13305600
STM1E-12.pmthresholds.rs.nearend.1day.ES	5000	0	86400
STM1E-12.pmthresholds.rs.nearend.1day.SES	5000	0	86400
STM1E-12.pmthresholds.rs.nearend.1day.UAS	5000	0	86400

## C.2.10 STM4 Card Default Settings

Table C-10 lists the STM4 card default settings.

Table C-10 STM4 Card Default Settings

Default Name	Default Value	Minimum	Maximum
STM4.config.line.AdminSSMIn	STU		
STM4.config.line.AINSSoakTime	0.333333333333		
STM4.config.line.PJVC4Mon#	0	0	4
STM4.config.line.SDBER	1e-007		
STM4.config.line.Send<FF>DoNotUse	FALSE		
STM4.config.line.SendDoNotUse	FALSE		
STM4.config.line.SFBER	0.0001		
STM4.config.line.State	unlocked, automaticInService		
STM4.config.line.SyncMsgIn	TRUE		
STM4.config.vc4.IPPMEnabled	FALSE		
STM4.pmthresholds.ms.farend.15min.BBE	5315	0	552600
STM4.pmthresholds.ms.farend.15min.EB	5315	0	552600
STM4.pmthresholds.ms.farend.15min.ES	87	0	900
STM4.pmthresholds.ms.farend.15min.SES	1	0	900
STM4.pmthresholds.ms.farend.15min.UAS	3	0	900
STM4.pmthresholds.ms.farend.1day.BBE	53150	0	53049600
STM4.pmthresholds.ms.farend.1day.EB	53150	0	53049600
STM4.pmthresholds.ms.farend.1day.ES	864	0	86400
STM4.pmthresholds.ms.farend.1day.SES	4	0	900
STM4.pmthresholds.ms.farend.1day.UAS	10	0	86400
STM4.pmthresholds.ms.nearend.15min.BBE	5315	0	552600
STM4.pmthresholds.ms.nearend.15min.EB	5315	0	552600

Table C-10 STM4 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM4.pmthresholds.ms.nearend.15min.ES	87	0	900
STM4.pmthresholds.ms.nearend.15min.PSC	1	0	600
STM4.pmthresholds.ms.nearend.15min.PSC-W	1	0	600
STM4.pmthresholds.ms.nearend.15min.PSD	300	0	900
STM4.pmthresholds.ms.nearend.15min.PSD-W	300	0	900
STM4.pmthresholds.ms.nearend.15min.SES	1	0	900
STM4.pmthresholds.ms.nearend.15min.UAS	3	0	900
STM4.pmthresholds.ms.nearend.1day.BBE	53150	0	53049600
STM4.pmthresholds.ms.nearend.1day.EB	53150	0	53049600
STM4.pmthresholds.ms.nearend.1day.ES	864	0	86400
STM4.pmthresholds.ms.nearend.1day.PSC	5	0	57600
STM4.pmthresholds.ms.nearend.1day.PSC-W	5	0	57600
STM4.pmthresholds.ms.nearend.1day.PSD	600	0	86400
STM4.pmthresholds.ms.nearend.1day.PSD-W	600	0	86400
STM4.pmthresholds.ms.nearend.1day.SES	4	0	86400
STM4.pmthresholds.ms.nearend.1day.UAS	10	0	86400
STM4.pmthresholds.path.nearend.15min.BBE	25	0	2159100
STM4.pmthresholds.path.nearend.15min.EB	15	0	7200000
STM4.pmthresholds.path.nearend.15min.ES	12	0	900
STM4.pmthresholds.path.nearend.15min.NPJC-PDET	60	0	7200000
STM4.pmthresholds.path.nearend.15min.NPJC-PGEN	60	0	7200000
STM4.pmthresholds.path.nearend.15min.PJCDIFF	60	0	14400000
STM4.pmthresholds.path.nearend.15min.PJCS-PDET	100	0	900
STM4.pmthresholds.path.nearend.15min.PJCS-PGEN	100	0	900
STM4.pmthresholds.path.nearend.15min.PPJC-PDET	60	0	7200000
STM4.pmthresholds.path.nearend.15min.PPJC-PGEN	60	0	7200000
STM4.pmthresholds.path.nearend.15min.SES	3	0	900
STM4.pmthresholds.path.nearend.15min.UAS	10	0	900
STM4.pmthresholds.path.nearend.1day.BBE	250	0	207273600
STM4.pmthresholds.path.nearend.1day.EB	125	0	691200000
STM4.pmthresholds.path.nearend.1day.ES	100	0	86400
STM4.pmthresholds.path.nearend.1day.NPJC-PDET	5760	0	691200000
STM4.pmthresholds.path.nearend.1day.NPJC-PGEN	5760	0	691200000
STM4.pmthresholds.path.nearend.1day.PJCDIFF	5760	0	1382400000
STM4.pmthresholds.path.nearend.1day.PJCS-PDET	9600	0	86400
STM4.pmthresholds.path.nearend.1day.PJCS-PGEN	9600	0	86400

Table C-10 STM4 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM4.pmthresholds.path.nearend.1day.PPJC-PDET	5760	0	691200000
STM4.pmthresholds.path.nearend.1day.PPJC-PGEN	5760	0	691200000
STM4.pmthresholds.path.nearend.1day.SES	7	0	86400
STM4.pmthresholds.path.nearend.1day.UAS	10	0	86400
STM4.pmthresholds.rs.nearend.15min.BBE	10000	0	553500
STM4.pmthresholds.rs.nearend.15min.EB	10000	0	553500
STM4.pmthresholds.rs.nearend.15min.ES	500	0	900
STM4.pmthresholds.rs.nearend.15min.SES	500	0	900
STM4.pmthresholds.rs.nearend.1day.BBE	100000	0	53136000
STM4.pmthresholds.rs.nearend.1day.EB	100000	0	53136000
STM4.pmthresholds.rs.nearend.1day.ES	5000	0	86400
STM4.pmthresholds.rs.nearend.1day.SES	5000	0	86400

## C.2.11 STM4-4 Card Default Settings

Table C-11 lists the STM4-4 card default settings.

Table C-11 STM4-4 Card Default Settings

Default Name	Default Value	Minimum	Maximum
STM4-4.config.line.AdminSSMIn	STU		
STM4-4.config.line.AINSSoakTime	0.333333333333		
STM4-4.config.line.PJVC4Mon#	0	0	4
STM4-4.config.line.SDBER	1e-007		
STM4-4.config.line.Send<FF>DoNotUse	FALSE		
STM4-4.config.line.SendDoNotUse	FALSE		
STM4-4.config.line.SFBER	0.0001		
STM4-4.config.line.State	unlocked, automaticInService		
STM4-4.config.line.SyncMsgIn	TRUE		
STM4-4.config.vc4.IPPMEnabled	FALSE		
STM4-4.pmthresholds.ms.farend.15min.BBE	5315	0	552600
STM4-4.pmthresholds.ms.farend.15min.EB	5315	0	552600
STM4-4.pmthresholds.ms.farend.15min.ES	87	0	900
STM4-4.pmthresholds.ms.farend.15min.SES	1	0	900
STM4-4.pmthresholds.ms.farend.15min.UAS	3	0	900
STM4-4.pmthresholds.ms.farend.1day.BBE	53150	0	53049600
STM4-4.pmthresholds.ms.farend.1day.EB	53150	0	53049600



Table C-11 STM4-4 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM4-4.pmthresholds.ms.farend.1day.ES	864	0	86400
STM4-4.pmthresholds.ms.farend.1day.SES	4	0	86400
STM4-4.pmthresholds.ms.farend.1day.UAS	10	0	86400
STM4-4.pmthresholds.ms.nearend.15min.BBE	5315	0	552600
STM4-4.pmthresholds.ms.nearend.15min.EB	5315	0	552600
STM4-4.pmthresholds.ms.nearend.15min.ES	87	0	900
STM4-4.pmthresholds.ms.nearend.15min.PSC	1	0	600
STM4-4.pmthresholds.ms.nearend.15min.PSC-W	1	0	600
STM4-4.pmthresholds.ms.nearend.15min.PSD	300	0	900
STM4-4.pmthresholds.ms.nearend.15min.PSD-W	300	0	900
STM4-4.pmthresholds.ms.nearend.15min.SES	1	0	900
STM4-4.pmthresholds.ms.nearend.15min.UAS	3	0	900
STM4-4.pmthresholds.ms.nearend.1day.BBE	53150	0	53049600
STM4-4.pmthresholds.ms.nearend.1day.EB	53150	0	53049600
STM4-4.pmthresholds.ms.nearend.1day.ES	864	0	86400
STM4-4.pmthresholds.ms.nearend.1day.PSC	5	0	57600
STM4-4.pmthresholds.ms.nearend.1day.PSC-W	5	0	57600
STM4-4.pmthresholds.ms.nearend.1day.PSD	600	0	86400
STM4-4.pmthresholds.ms.nearend.1day.PSD-W	600	0	86400
STM4-4.pmthresholds.ms.nearend.1day.SES	4	0	86400
STM4-4.pmthresholds.ms.nearend.1day.UAS	10	0	86400
STM4-4.pmthresholds.path.nearend.15min.BBE	25	0	2159100
STM4-4.pmthresholds.path.nearend.15min.EB	15	0	7200000
STM4-4.pmthresholds.path.nearend.15min.ES	12	0	900
STM4-4.pmthresholds.path.nearend.15min.NPJC-PDET	60	0	691200000
STM4-4.pmthresholds.path.nearend.15min.NPJC-PGEN	60	0	691200000
STM4-4.pmthresholds.path.nearend.15min.PJCDIFF	60	0	14400000
STM4-4.pmthresholds.path.nearend.15min.PJCS-PDET	100	0	900
STM4-4.pmthresholds.path.nearend.15min.PJCS-PGEN	100	0	900
STM4-4.pmthresholds.path.nearend.15min.PPJC-PDET	60	0	691200000
STM4-4.pmthresholds.path.nearend.15min.PPJC-PGEN	60	0	691200000
STM4-4.pmthresholds.path.nearend.15min.SES	3	0	900
STM4-4.pmthresholds.path.nearend.15min.UAS	10	0	900
STM4-4.pmthresholds.path.nearend.1day.BBE	250	0	207273600
STM4-4.pmthresholds.path.nearend.1day.EB	125	0	691200000
STM4-4.pmthresholds.path.nearend.1day.ES	100	0	86400

**Table C-11** STM4-4 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM4-4.pmthresholds.path.nearend.1day.NPJC-PDET	5760	0	691200000
STM4-4.pmthresholds.path.nearend.1day.NPJC-PGEN	5760	0	691200000
STM4-4.pmthresholds.path.nearend.1day.PJCDIFF	5760	0	1382400000
STM4-4.pmthresholds.path.nearend.1day.PJCS-PDET	9600	0	86400
STM4-4.pmthresholds.path.nearend.1day.PJCS-PGEN	9600	0	86400
STM4-4.pmthresholds.path.nearend.1day.PPJC-PDET	5760	0	691200000
STM4-4.pmthresholds.path.nearend.1day.PPJC-PGEN	5760	0	691200000
STM4-4.pmthresholds.path.nearend.1day.SES	7	0	86400
STM4-4.pmthresholds.path.nearend.1day.UAS	10	0	86400
STM4-4.pmthresholds.rs.nearend.15min.BBE	10000	0	553500
STM4-4.pmthresholds.rs.nearend.15min.EB	10000	0	553500
STM4-4.pmthresholds.rs.nearend.15min.ES	500	0	900
STM4-4.pmthresholds.rs.nearend.15min.SES	500	0	900
STM4-4.pmthresholds.rs.nearend.1day.BBE	100000	0	53136000
STM4-4.pmthresholds.rs.nearend.1day.EB	100000	0	53136000
STM4-4.pmthresholds.rs.nearend.1day.ES	5000	0	86400
STM4-4.pmthresholds.rs.nearend.1day.SES	5000	0	86400

## C.2.12 STM16 Card Default Settings

Table C-12 lists the STM16 card default settings.

**Table C-12** STM16 Card Default Settings

Default Name	Default Value	Minimum	Maximum
STM16.config.line.AdminSSMIn	STU		
STM16.config.line.AINSSoakTime	0.333333333333		
STM16.config.line.AlsMode	Disabled		
STM16.config.line.AlsRecoveryPulseDuration	2		
STM16.config.line.AlsRecoveryPulseInterval	100	60	300
STM16.config.line.PJVC4Mon#	0	0	16
STM16.config.line.SDBER	1e-007		
STM16.config.line.Send<FF>DoNotUse	FALSE		
STM16.config.line.SendDoNotUse	FALSE		
STM16.config.line.SFBER	0.0001		
STM16.config.line.State	unlocked, automaticInService		
STM16.config.line.SyncMsgIn	TRUE		

Table C-12 STM16 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM16.config.vc4.IPPMEnabled	FALSE		
STM16.pmthresholds.ms.farend.15min.BBE	21260	0	2212200
STM16.pmthresholds.ms.farend.15min.EB	21260	0	2212200
STM16.pmthresholds.ms.farend.15min.ES	87	0	900
STM16.pmthresholds.ms.farend.15min.SES	1	0	900
STM16.pmthresholds.ms.farend.15min.UAS	3	0	900
STM16.pmthresholds.ms.farend.1day.BBE	212600	0	212371200
STM16.pmthresholds.ms.farend.1day.EB	212600	0	212371200
STM16.pmthresholds.ms.farend.1day.ES	864	0	86400
STM16.pmthresholds.ms.farend.1day.SES	4	0	86400
STM16.pmthresholds.ms.farend.1day.UAS	10	0	86400
STM16.pmthresholds.ms.nearend.15min.BBE	21260	0	2212200
STM16.pmthresholds.ms.nearend.15min.EB	21260	0	2212200
STM16.pmthresholds.ms.nearend.15min.ES	87	0	900
STM16.pmthresholds.ms.nearend.15min.PSC	1	0	600
STM16.pmthresholds.ms.nearend.15min.PSC-R	1	0	600
STM16.pmthresholds.ms.nearend.15min.PSC-S	1	0	600
STM16.pmthresholds.ms.nearend.15min.PSC-W	1	0	600
STM16.pmthresholds.ms.nearend.15min.PSD	300	0	900
STM16.pmthresholds.ms.nearend.15min.PSD-R	300	0	900
STM16.pmthresholds.ms.nearend.15min.PSD-S	300	0	900
STM16.pmthresholds.ms.nearend.15min.PSD-W	300	0	900
STM16.pmthresholds.ms.nearend.15min.SES	1	0	900
STM16.pmthresholds.ms.nearend.15min.UAS	3	0	900
STM16.pmthresholds.ms.nearend.1day.BBE	212600	0	212371200
STM16.pmthresholds.ms.nearend.1day.EB	212600	0	212371200
STM16.pmthresholds.ms.nearend.1day.ES	864	0	86400
STM16.pmthresholds.ms.nearend.1day.PSC	5	0	57600
STM16.pmthresholds.ms.nearend.1day.PSC-R	5	0	57600
STM16.pmthresholds.ms.nearend.1day.PSC-S	5	0	57600
STM16.pmthresholds.ms.nearend.1day.PSC-W	5	0	57600
STM16.pmthresholds.ms.nearend.1day.PSD	600	0	86400
STM16.pmthresholds.ms.nearend.1day.PSD-R	600	0	86400
STM16.pmthresholds.ms.nearend.1day.PSD-S	600	0	86400
STM16.pmthresholds.ms.nearend.1day.PSD-W	600	0	86400
STM16.pmthresholds.ms.nearend.1day.SES	4	0	86400

Table C-12 STM16 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM16.pmthresholds.ms.nearend.1day.UAS	10	0	86400
STM16.pmthresholds.path.nearend.15min.BBE	25	0	2159100
STM16.pmthresholds.path.nearend.15min.EB	15	0	7200000
STM16.pmthresholds.path.nearend.15min.ES	12	0	900
STM16.pmthresholds.path.nearend.15min.NPJC-PDET	60	0	7200000
STM16.pmthresholds.path.nearend.15min.NPJC-PGEN	60	0	7200000
STM16.pmthresholds.path.nearend.15min.PJCDIFF	60	0	14400000
STM16.pmthresholds.path.nearend.15min.PJCS-PDET	100	0	900
STM16.pmthresholds.path.nearend.15min.PJCS-PGEN	100	0	900
STM16.pmthresholds.path.nearend.15min.PPJC-PDET	60	0	7200000
STM16.pmthresholds.path.nearend.15min.PPJC-PGEN	60	0	7200000
STM16.pmthresholds.path.nearend.15min.SES	3	0	900
STM16.pmthresholds.path.nearend.15min.UAS	10	0	900
STM16.pmthresholds.path.nearend.1day.BBE	250	0	207273600
STM16.pmthresholds.path.nearend.1day.EB	125	0	691200000
STM16.pmthresholds.path.nearend.1day.ES	100	0	86400
STM16.pmthresholds.path.nearend.1day.NPJC-PDET	5760	0	691200000
STM16.pmthresholds.path.nearend.1day.NPJC-PGEN	5760	0	691200000
STM16.pmthresholds.path.nearend.1day.PJCDIFF	5760	0	1382400000
STM16.pmthresholds.path.nearend.1day.PJCS-PDET	9600	0	86400
STM16.pmthresholds.path.nearend.1day.PJCS-PGEN	9600	0	86400
STM16.pmthresholds.path.nearend.1day.PPJC-PDET	5760	0	691200000
STM16.pmthresholds.path.nearend.1day.PPJC-PGEN	5760	0	691200000
STM16.pmthresholds.path.nearend.1day.SES	7	0	86400
STM16.pmthresholds.path.nearend.1day.UAS	10	0	86400
STM16.pmthresholds.rs.nearend.15min.BBE	10000	0	2151900
STM16.pmthresholds.rs.nearend.15min.EB	10000	0	2151900
STM16.pmthresholds.rs.nearend.15min.ES	500	0	900
STM16.pmthresholds.rs.nearend.15min.SES	500	0	900
STM16.pmthresholds.rs.nearend.1day.BBE	100000	0	206582400
STM16.pmthresholds.rs.nearend.1day.EB	100000	0	206582400
STM16.pmthresholds.rs.nearend.1day.ES	5000	0	86400
STM16.pmthresholds.rs.nearend.1day.SES	5000	0	86400

## C.2.13 STM64 Card Default Settings

Table C-13 lists the STM64 card default settings.

**Table C-13** STM64 Card Default Settings

Default Name	Default Value	Minimum	Maximum
STM64.config.line.AdminSSMIn	STU		
STM64.config.line.AINSSoakTime	0.333333333333		
STM64.config.line.AlsMode	Disabled		
STM64.config.line.AlsRecoveryPulseDuration	2		
STM64.config.line.AlsRecoveryPulseInterval	100	60	300
STM64.config.line.PJVC4Mon#	0	0	64
STM64.config.line.SDBER	1e-007		
STM64.config.line.Send<FF>DoNotUse	FALSE		
STM64.config.line.SendDoNotUse	FALSE		
STM64.config.line.SFBER	0.0001		
STM64.config.line.State	unlocked, automaticInService		
STM64.config.line.SyncMsgIn	TRUE		
STM64.config.vc4.IPPMEnabled	FALSE		
STM64.pmthresholds.ms.farend.15min.BBE	85040	0	8850600
STM64.pmthresholds.ms.farend.15min.EB	85040	0	8850600
STM64.pmthresholds.ms.farend.15min.ES	87	0	900
STM64.pmthresholds.ms.farend.15min.SES	1	0	900
STM64.pmthresholds.ms.farend.15min.UAS	3	0	900
STM64.pmthresholds.ms.farend.1day.BBE	850400	0	849657600
STM64.pmthresholds.ms.farend.1day.EB	850400	0	849657600
STM64.pmthresholds.ms.farend.1day.ES	864	0	86400
STM64.pmthresholds.ms.farend.1day.SES	4	0	86400
STM64.pmthresholds.ms.farend.1day.UAS	10	0	86400
STM64.pmthresholds.ms.nearend.15min.BBE	85040	0	8850600
STM64.pmthresholds.ms.nearend.15min.EB	85040	0	8850600
STM64.pmthresholds.ms.nearend.15min.ES	87	0	900
STM64.pmthresholds.ms.nearend.15min.PSC	1	0	600
STM64.pmthresholds.ms.nearend.15min.PSC-R	1	0	600
STM64.pmthresholds.ms.nearend.15min.PSC-S	1	0	600
STM64.pmthresholds.ms.nearend.15min.PSC-W	1	0	600
STM64.pmthresholds.ms.nearend.15min.PSD	300	0	900
STM64.pmthresholds.ms.nearend.15min.PSD-R	300	0	900

Table C-13 STM64 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM64.pmthresholds.ms.nearend.15min.PSD-S	300	0	900
STM64.pmthresholds.ms.nearend.15min.PSD-W	300	0	900
STM64.pmthresholds.ms.nearend.15min.SES	1	0	900
STM64.pmthresholds.ms.nearend.15min.UAS	3	0	900
STM64.pmthresholds.ms.nearend.1day.BBE	850400	0	849657600
STM64.pmthresholds.ms.nearend.1day.EB	850400	0	849657600
STM64.pmthresholds.ms.nearend.1day.ES	864	0	86400
STM64.pmthresholds.ms.nearend.1day.PSC	5	0	57600
STM64.pmthresholds.ms.nearend.1day.PSC-R	5	0	57600
STM64.pmthresholds.ms.nearend.1day.PSC-S	5	0	57600
STM64.pmthresholds.ms.nearend.1day.PSC-W	5	0	57600
STM64.pmthresholds.ms.nearend.1day.PSD	600	0	86400
STM64.pmthresholds.ms.nearend.1day.PSD-R	600	0	86400
STM64.pmthresholds.ms.nearend.1day.PSD-S	600	0	86400
STM64.pmthresholds.ms.nearend.1day.PSD-W	600	0	86400
STM64.pmthresholds.ms.nearend.1day.SES	4	0	86400
STM64.pmthresholds.ms.nearend.1day.UAS	10	0	86400
STM64.pmthresholds.path.nearend.15min.BBE	25	0	2159100
STM64.pmthresholds.path.nearend.15min.EB	15	0	7200000
STM64.pmthresholds.path.nearend.15min.ES	12	0	900
STM64.pmthresholds.path.nearend.15min.NPJC-PDET	60	0	7200000
STM64.pmthresholds.path.nearend.15min.NPJC-PGEN	60	0	7200000
STM64.pmthresholds.path.nearend.15min.PJCDIFF	60	0	14400000
STM64.pmthresholds.path.nearend.15min.PJCS-PDET	100	0	900
STM64.pmthresholds.path.nearend.15min.PJCS-PGEN	100	0	900
STM64.pmthresholds.path.nearend.15min.PPJC-PDET	60	0	7200000
STM64.pmthresholds.path.nearend.15min.PPJC-PGEN	60	0	7200000
STM64.pmthresholds.path.nearend.15min.SES	3	0	900
STM64.pmthresholds.path.nearend.15min.UAS	10	0	900
STM64.pmthresholds.path.nearend.1day.BBE	250	0	207273600
STM64.pmthresholds.path.nearend.1day.EB	125	0	691200000
STM64.pmthresholds.path.nearend.1day.ES	100	0	86400
STM64.pmthresholds.path.nearend.1day.NPJC-PDET	5760	0	691200000
STM64.pmthresholds.path.nearend.1day.NPJC-PGEN	5760	0	691200000
STM64.pmthresholds.path.nearend.1day.PJCDIFF	5760	0	1382400000
STM64.pmthresholds.path.nearend.1day.PJCS-PDET	9600	0	86400

Table C-13 STM64 Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
STM64.pmthresholds.path.nearend.1day.PJCS-PGEN	9600	0	86400
STM64.pmthresholds.path.nearend.1day.PPJC-PDET	5760	0	691200000
STM64.pmthresholds.path.nearend.1day.PPJC-PGEN	5760	0	691200000
STM64.pmthresholds.path.nearend.1day.SES	7	0	86400
STM64.pmthresholds.path.nearend.1day.UAS	10	0	86400
STM64.pmthresholds.rs.nearend.15min.BBE	10000	0	7967700
STM64.pmthresholds.rs.nearend.15min.EB	10000	0	7967700
STM64.pmthresholds.rs.nearend.15min.ES	500	0	900
STM64.pmthresholds.rs.nearend.15min.SES	500	0	900
STM64.pmthresholds.rs.nearend.1day.BBE	100000	0	764899200
STM64.pmthresholds.rs.nearend.1day.EB	100000	0	764899200
STM64.pmthresholds.rs.nearend.1day.ES	5000	0	86400
STM64.pmthresholds.rs.nearend.1day.SES	5000	0	86400

## C.2.14 MXP\_2.5G\_10G Card Default Settings

Table C-14 lists the MXP\_2.5G\_10G card default settings.

Table C-14 MXP-2.5G-10G Card Default Settings

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10G.config.client.AINSSoakTime	0.333333333333		
MXP-2_5G-10G.config.client.AlsMode	Disabled		
MXP-2_5G-10G.config.client.AlsRecoveryPulseDuration	4		
MXP-2_5G-10G.config.client.AlsRecoveryPulseInterval	100	60	300
MXP-2_5G-10G.config.client.ppmPortAssignment	STM16_PORT		
MXP-2_5G-10G.config.client.ppmSlotAssignment	UNASSIGNED		
MXP-2_5G-10G.config.client.SDBER	1e-007		
MXP-2_5G-10G.config.client.SendDoNotUse	FALSE		
MXP-2_5G-10G.config.client.SFBER	0.0001		
MXP-2_5G-10G.config.client.SyncMsgIn	TRUE		
MXP-2_5G-10G.config.client.TerminationMode	Transparent		
MXP-2_5G-10G.config.trunk.AINSSoakTime	0.333333333333		
MXP-2_5G-10G.config.trunk.AlsMode	Disabled		
MXP-2_5G-10G.config.trunk.AlsRecoveryPulseDuration	4		
MXP-2_5G-10G.config.trunk.AlsRecoveryPulseInterval	100	60	300
MXP-2_5G-10G.opticalthresholds.client.alarm.HighLaserBias	90		

Table C-14 MXP-2.5G-10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10G.opticalthresholds.client.alarm.HighRxPower	3		
MXP-2_5G-10G.opticalthresholds.client.alarm.HighTxPower	3		
MXP-2_5G-10G.opticalthresholds.client.alarm.LowRxPower	-21		
MXP-2_5G-10G.opticalthresholds.client.alarm.LowTxPower	-8		
MXP-2_5G-10G.opticalthresholds.client.warning.15min.HighLaserBias	81		
MXP-2_5G-10G.opticalthresholds.client.warning.15min.HighRxPower	2		
MXP-2_5G-10G.opticalthresholds.client.warning.15min.HighTxPower	2		
MXP-2_5G-10G.opticalthresholds.client.warning.15min.LowRxPower	-20		
MXP-2_5G-10G.opticalthresholds.client.warning.15min.LowTxPower	-7		
MXP-2_5G-10G.opticalthresholds.client.warning.1day.HighLaserBias	85.5		
MXP-2_5G-10G.opticalthresholds.client.warning.1day.HighRxPower	2.5		
MXP-2_5G-10G.opticalthresholds.client.warning.1day.HighTxPower	2.5		
MXP-2_5G-10G.opticalthresholds.client.warning.1day.LowRxPower	-20.5		
MXP-2_5G-10G.opticalthresholds.client.warning.1day.LowTxPower	-7.5		
MXP-2_5G-10G.opticalthresholds.trunk.alarm.HighLaserBias	90		
MXP-2_5G-10G.opticalthresholds.trunk.alarm.HighRxPower	-7		
MXP-2_5G-10G.opticalthresholds.trunk.alarm.HighTxPower	4		
MXP-2_5G-10G.opticalthresholds.trunk.alarm.LowRxPower	-25		
MXP-2_5G-10G.opticalthresholds.trunk.alarm.LowTxPower	2		
MXP-2_5G-10G.opticalthresholds.trunk.warning.15min.HighLaserBias	81		
MXP-2_5G-10G.opticalthresholds.trunk.warning.15min.HighRxPower	-7.5		
MXP-2_5G-10G.opticalthresholds.trunk.warning.15min.HighTxPower	3.5		
MXP-2_5G-10G.opticalthresholds.trunk.warning.15min.LowRxPower	-24.5		
MXP-2_5G-10G.opticalthresholds.trunk.warning.15min.LowTxPower	2.5		
MXP-2_5G-10G.opticalthresholds.trunk.warning.1day.HighLaserBias	85.5		
MXP-2_5G-10G.opticalthresholds.trunk.warning.1day.HighRxPower	-7.3		
MXP-2_5G-10G.opticalthresholds.trunk.warning.1day.HighTxPower	3.7		
MXP-2_5G-10G.opticalthresholds.trunk.warning.1day.LowRxPower	-24.7		
MXP-2_5G-10G.opticalthresholds.trunk.warning.1day.LowTxPower	2.3		
MXP-2_5G-10G.otn.fec thresholds.standard.15min.BitErrorsCorrected	903330	0	9033621811200
MXP-2_5G-10G.otn.fec thresholds.standard.15min.UncorrectableWords	5	0	4724697600
MXP-2_5G-10G.otn.fec thresholds.standard.1day.BitErrorsCorrected	86719680	0	867227693875200
MXP-2_5G-10G.otn.fec thresholds.standard.1day.UncorrectableWords	480	0	453570969600
MXP-2_5G-10G.otn.g709thresholds.pm.farend.15min.BBE	85040	0	8850600
MXP-2_5G-10G.otn.g709thresholds.pm.farend.15min.ES	87	0	900
MXP-2_5G-10G.otn.g709thresholds.pm.farend.15min.FC	10	0	72



Table C-14 MXP-2.5G-10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10G.otn.g709thresholds.pm.farend.15min.SES	1	0	900
MXP-2_5G-10G.otn.g709thresholds.pm.farend.15min.UAS	3	0	900
MXP-2_5G-10G.otn.g709thresholds.pm.farend.1day.BBE	850400	0	849657600
MXP-2_5G-10G.otn.g709thresholds.pm.farend.1day.ES	864	0	86400
MXP-2_5G-10G.otn.g709thresholds.pm.farend.1day.FC	40	0	6912
MXP-2_5G-10G.otn.g709thresholds.pm.farend.1day.SES	4	0	86400
MXP-2_5G-10G.otn.g709thresholds.pm.farend.1day.UAS	10	0	86400
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.15min.BBE	85040	0	8850600
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.15min.ES	87	0	900
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.15min.FC	10	0	72
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.15min.SES	1	0	900
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.15min.UAS	3	0	900
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.1day.BBE	850400	0	849657600
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.1day.ES	864	0	86400
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.1day.FC	40	0	6912
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.1day.SES	4	0	86400
MXP-2_5G-10G.otn.g709thresholds.pm.nearend.1day.UAS	10	0	86400
MXP-2_5G-10G.otn.g709thresholds.sm.farend.15min.BBE	10000	0	8850600
MXP-2_5G-10G.otn.g709thresholds.sm.farend.15min.ES	500	0	900
MXP-2_5G-10G.otn.g709thresholds.sm.farend.15min.FC	10	0	72
MXP-2_5G-10G.otn.g709thresholds.sm.farend.15min.SES	500	0	900
MXP-2_5G-10G.otn.g709thresholds.sm.farend.15min.UAS	500	0	900
MXP-2_5G-10G.otn.g709thresholds.sm.farend.1day.BBE	100000	0	849657600
MXP-2_5G-10G.otn.g709thresholds.sm.farend.1day.ES	5000	0	86400
MXP-2_5G-10G.otn.g709thresholds.sm.farend.1day.FC	40	0	6912
MXP-2_5G-10G.otn.g709thresholds.sm.farend.1day.SES	5000	0	86400
MXP-2_5G-10G.otn.g709thresholds.sm.farend.1day.UAS	5000	0	86400
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.15min.BBE	10000	0	8850600
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.15min.ES	500	0	900
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.15min.FC	10	0	72
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.15min.SES	500	0	900
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.15min.UAS	500	0	900
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.1day.BBE	100000	0	849657600
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.1day.ES	5000	0	86400
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.1day.FC	40	0	6912
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.1day.SES	5000	0	86400

Table C-14 MXP-2.5G-10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10G.otn.g709thresholds.sm.nearend.1day.UAS	5000	0	86400
MXP-2_5G-10G.otn.otnLines.FEC	Standard		
MXP-2_5G-10G.otn.otnLines.G709OTN	TRUE		
MXP-2_5G-10G.otn.otnLines.SDBER	1e-007		
MXP-2_5G-10G.pmthresholds.client.ms.farend.15min.BBE	21260	0	2212200
MXP-2_5G-10G.pmthresholds.client.ms.farend.15min.EB	21260	0	2212200
MXP-2_5G-10G.pmthresholds.client.ms.farend.15min.ES	87	0	900
MXP-2_5G-10G.pmthresholds.client.ms.farend.15min.SES	1	0	900
MXP-2_5G-10G.pmthresholds.client.ms.farend.15min.UAS	3	0	900
MXP-2_5G-10G.pmthresholds.client.ms.farend.1day.BBE	212600	0	212371200
MXP-2_5G-10G.pmthresholds.client.ms.farend.1day.EB	212600	0	212371200
MXP-2_5G-10G.pmthresholds.client.ms.farend.1day.ES	864	0	86400
MXP-2_5G-10G.pmthresholds.client.ms.farend.1day.SES	4	0	86400
MXP-2_5G-10G.pmthresholds.client.ms.farend.1day.UAS	10	0	86400
MXP-2_5G-10G.pmthresholds.client.ms.nearend.15min.BBE	21260	0	2212200
MXP-2_5G-10G.pmthresholds.client.ms.nearend.15min.EB	21260	0	2212200
MXP-2_5G-10G.pmthresholds.client.ms.nearend.15min.ES	87	0	900
MXP-2_5G-10G.pmthresholds.client.ms.nearend.15min.SES	1	0	900
MXP-2_5G-10G.pmthresholds.client.ms.nearend.15min.UAS	3	0	900
MXP-2_5G-10G.pmthresholds.client.ms.nearend.1day.BBE	212600	0	212371200
MXP-2_5G-10G.pmthresholds.client.ms.nearend.1day.EB	212600	0	212371200
MXP-2_5G-10G.pmthresholds.client.ms.nearend.1day.ES	864	0	86400
MXP-2_5G-10G.pmthresholds.client.ms.nearend.1day.SES	4	0	86400
MXP-2_5G-10G.pmthresholds.client.ms.nearend.1day.UAS	10	0	86400
MXP-2_5G-10G.pmthresholds.client.rs.nearend.15min.BBE	10000	0	2212200
MXP-2_5G-10G.pmthresholds.client.rs.nearend.15min.EB	10000	0	2151900
MXP-2_5G-10G.pmthresholds.client.rs.nearend.15min.ES	500	0	900
MXP-2_5G-10G.pmthresholds.client.rs.nearend.15min.SES	500	0	900
MXP-2_5G-10G.pmthresholds.client.rs.nearend.15min.UAS	500	0	900
MXP-2_5G-10G.pmthresholds.client.rs.nearend.1day.BBE	100000	0	212371200
MXP-2_5G-10G.pmthresholds.client.rs.nearend.1day.EB	100000	0	206582400
MXP-2_5G-10G.pmthresholds.client.rs.nearend.1day.ES	5000	0	86400
MXP-2_5G-10G.pmthresholds.client.rs.nearend.1day.SES	5000	0	86400
MXP-2_5G-10G.pmthresholds.client.rs.nearend.1day.UAS	5000	0	86400
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.15min.BBE	85040	0	8850600
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.15min.EB	85040	0	8850600

Table C-14 MXP-2.5G-10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.15min.ES	87	0	900
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.15min.SES	1	0	900
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.15min.UAS	3	0	900
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.1day.BBE	850400	0	849657600
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.1day.EB	850400	0	849657600
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.1day.ES	864	0	86400
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.1day.SES	4	0	86400
MXP-2_5G-10G.pmthresholds.trunk.ms.farend.1day.UAS	10	0	86400
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.15min.BBE	85040	0	8850600
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.15min.EB	85040	0	8850600
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.15min.ES	87	0	900
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.15min.SES	1	0	900
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.15min.UAS	3	0	900
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.1day.BBE	850400	0	849657600
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.1day.EB	850400	0	849657600
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.1day.ES	864	0	86400
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.1day.SES	4	0	86400
MXP-2_5G-10G.pmthresholds.trunk.ms.nearend.1day.UAS	10	0	86400
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.15min.BBE	10000	0	8850600
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.15min.EB	10000	0	7967700
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.15min.ES	500	0	900
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.15min.SES	500	0	900
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.15min.UAS	500	0	900
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.1day.BBE	100000	0	849657600
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.1day.EB	100000	0	764899200
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.1day.ES	5000	0	86400
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.1day.SES	5000	0	86400
MXP-2_5G-10G.pmthresholds.trunk.rs.nearend.1day.UAS	5000	0	86400

## C.2.15 MXP\_2.5G\_10E Card Default Settings

Table C-15 lists the MXP\_2.5G\_10E card default settings.

Table C-15 MXP-2.5G-10E Card Default Settings

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10E.config.client.AINSSoakTime	0.333333333333		
MXP-2_5G-10E.config.client.AisSquelchMode	Squelch		
MXP-2_5G-10E.config.client.AlsMode	Disabled		
MXP-2_5G-10E.config.client.AlsRecoveryPulseDuration	2		
MXP-2_5G-10E.config.client.AlsRecoveryPulseInterval	100	100	2000
MXP-2_5G-10E.config.client.ppmPortAssignment	STM16_PORT		
MXP-2_5G-10E.config.client.ppmSlotAssignment	UNASSIGNED		
MXP-2_5G-10E.config.client.SDBER	1e-007		
MXP-2_5G-10E.config.client.SendDoNotUse	FALSE		
MXP-2_5G-10E.config.client.SFBER	0.0001		
MXP-2_5G-10E.config.client.SyncMsgIn	TRUE		
MXP-2_5G-10E.config.client.TerminationMode	Transparent		
MXP-2_5G-10E.config.trunk.AINSSoakTime	0.333333333333		
MXP-2_5G-10E.config.trunk.AlsMode	Disabled		
MXP-2_5G-10E.config.trunk.AlsRecoveryPulseDuration	100		
MXP-2_5G-10E.config.trunk.AlsRecoveryPulseInterval	300	200	2000
MXP-2_5G-10E.opticalthresholds.client.alarm.HighLaserBias	90		
MXP-2_5G-10E.opticalthresholds.client.alarm.HighRxPower	3		
MXP-2_5G-10E.opticalthresholds.client.alarm.HighTxPower	3		
MXP-2_5G-10E.opticalthresholds.client.alarm.LowRxPower	-21		
MXP-2_5G-10E.opticalthresholds.client.alarm.LowTxPower	-8		
MXP-2_5G-10E.opticalthresholds.client.warning.15min.HighLaserBias	81		
MXP-2_5G-10E.opticalthresholds.client.warning.15min.HighRxPower	2		
MXP-2_5G-10E.opticalthresholds.client.warning.15min.HighTxPower	2		
MXP-2_5G-10E.opticalthresholds.client.warning.15min.LowRxPower	-20		
MXP-2_5G-10E.opticalthresholds.client.warning.15min.LowTxPower	-7		
MXP-2_5G-10E.opticalthresholds.client.warning.1day.HighLaserBias	85.5		
MXP-2_5G-10E.opticalthresholds.client.warning.1day.HighRxPower	2.5		
MXP-2_5G-10E.opticalthresholds.client.warning.1day.HighTxPower	2.5		
MXP-2_5G-10E.opticalthresholds.client.warning.1day.LowRxPower	-20.5		
MXP-2_5G-10E.opticalthresholds.client.warning.1day.LowTxPower	-7.5		
MXP-2_5G-10E.opticalthresholds.trunk.alarm.HighLaserBias	98		
MXP-2_5G-10E.opticalthresholds.trunk.alarm.HighRxPower	-7		
MXP-2_5G-10E.opticalthresholds.trunk.alarm.HighTxPower	8		
MXP-2_5G-10E.opticalthresholds.trunk.alarm.LowRxPower	-25		
MXP-2_5G-10E.opticalthresholds.trunk.alarm.LowTxPower	1		

Table C-15 MXP-2.5G-10E Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10E.opticalthresholds.trunk.warning.15min.HighLaserBias	95		
MXP-2_5G-10E.opticalthresholds.trunk.warning.15min.HighRxPower	-7.5		
MXP-2_5G-10E.opticalthresholds.trunk.warning.15min.HighTxPower	7		
MXP-2_5G-10E.opticalthresholds.trunk.warning.15min.LowRxPower	-24.5		
MXP-2_5G-10E.opticalthresholds.trunk.warning.15min.LowTxPower	2		
MXP-2_5G-10E.opticalthresholds.trunk.warning.1day.HighLaserBias	96		
MXP-2_5G-10E.opticalthresholds.trunk.warning.1day.HighRxPower	-7.3		
MXP-2_5G-10E.opticalthresholds.trunk.warning.1day.HighTxPower	7		
MXP-2_5G-10E.opticalthresholds.trunk.warning.1day.LowRxPower	-24.7		
MXP-2_5G-10E.opticalthresholds.trunk.warning.1day.LowTxPower	2		
MXP-2_5G-10E.otn.fecthresholds.enhanced.15min.BitErrorsCorrected	903330	0	9033621811200
MXP-2_5G-10E.otn.fecthresholds.enhanced.15min.UncorrectableWords	5	0	4724697600
MXP-2_5G-10E.otn.fecthresholds.enhanced.1day.BitErrorsCorrected	86719680	0	867227693875200
MXP-2_5G-10E.otn.fecthresholds.enhanced.1day.UncorrectableWords	480	0	453570969600
MXP-2_5G-10E.otn.fecthresholds.standard.15min.BitErrorsCorrected	903330	0	9033621811200
MXP-2_5G-10E.otn.fecthresholds.standard.15min.UncorrectableWords	5	0	4724697600
MXP-2_5G-10E.otn.fecthresholds.standard.1day.BitErrorsCorrected	86719680	0	867227693875200
MXP-2_5G-10E.otn.fecthresholds.standard.1day.UncorrectableWords	480	0	453570969600
MXP-2_5G-10E.otn.g709thresholds.pm.farend.15min.BBE	85040	0	8850600
MXP-2_5G-10E.otn.g709thresholds.pm.farend.15min.ES	87	0	900
MXP-2_5G-10E.otn.g709thresholds.pm.farend.15min.FC	10	0	72
MXP-2_5G-10E.otn.g709thresholds.pm.farend.15min.SES	1	0	900
MXP-2_5G-10E.otn.g709thresholds.pm.farend.15min.UAS	3	0	900
MXP-2_5G-10E.otn.g709thresholds.pm.farend.1day.BBE	850400	0	849657600
MXP-2_5G-10E.otn.g709thresholds.pm.farend.1day.ES	864	0	86400
MXP-2_5G-10E.otn.g709thresholds.pm.farend.1day.FC	40	0	6912
MXP-2_5G-10E.otn.g709thresholds.pm.farend.1day.SES	4	0	86400
MXP-2_5G-10E.otn.g709thresholds.pm.farend.1day.UAS	10	0	86400
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.15min.BBE	85040	0	8850600
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.15min.ES	87	0	900
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.15min.FC	10	0	72
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.15min.SES	1	0	900

Table C-15 MXP-2.5G-10E Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.15min.UAS	3	0	900
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.1day.BBE	850400	0	849657600
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.1day.ES	864	0	86400
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.1day.FC	40	0	6912
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.1day.SES	4	0	86400
MXP-2_5G-10E.otn.g709thresholds.pm.nearend.1day.UAS	10	0	86400
MXP-2_5G-10E.otn.g709thresholds.sm.farend.15min.BBE	10000	0	8850600
MXP-2_5G-10E.otn.g709thresholds.sm.farend.15min.ES	500	0	900
MXP-2_5G-10E.otn.g709thresholds.sm.farend.15min.FC	10	0	72
MXP-2_5G-10E.otn.g709thresholds.sm.farend.15min.SES	500	0	900
MXP-2_5G-10E.otn.g709thresholds.sm.farend.15min.UAS	500	0	900
MXP-2_5G-10E.otn.g709thresholds.sm.farend.1day.BBE	100000	0	849657600
MXP-2_5G-10E.otn.g709thresholds.sm.farend.1day.ES	5000	0	86400
MXP-2_5G-10E.otn.g709thresholds.sm.farend.1day.FC	40	0	6912
MXP-2_5G-10E.otn.g709thresholds.sm.farend.1day.SES	5000	0	86400
MXP-2_5G-10E.otn.g709thresholds.sm.farend.1day.UAS	5000	0	86400
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.15min.BBE	10000	0	8850600
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.15min.ES	500	0	900
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.15min.FC	10	0	72
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.15min.SES	500	0	900
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.15min.UAS	500	0	900
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.1day.BBE	100000	0	849657600
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.1day.ES	5000	0	86400
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.1day.FC	40	0	6912
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.1day.SES	5000	0	86400
MXP-2_5G-10E.otn.g709thresholds.sm.nearend.1day.UAS	5000	0	86400
MXP-2_5G-10E.otn.otnLines.AsynchSynchMapping	ODU Multiplex		
MXP-2_5G-10E.otn.otnLines.FEC	Standard		
MXP-2_5G-10E.otn.otnLines.G709OTN	TRUE		
MXP-2_5G-10E.otn.otnLines.SDBER	1e-007		
MXP-2_5G-10E.pmthresholds.client.ms.farend.15min.BBE	21260	0	2212200
MXP-2_5G-10E.pmthresholds.client.ms.farend.15min.EB	21260	0	2212200
MXP-2_5G-10E.pmthresholds.client.ms.farend.15min.ES	87	0	900
MXP-2_5G-10E.pmthresholds.client.ms.farend.15min.SES	1	0	900
MXP-2_5G-10E.pmthresholds.client.ms.farend.15min.UAS	3	0	900
MXP-2_5G-10E.pmthresholds.client.ms.farend.1day.BBE	212600	0	212371200

**Table C-15** MXP-2.5G-10E Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-2_5G-10E.pmthresholds.client.ms.farend.1day.EB	212600	0	212371200
MXP-2_5G-10E.pmthresholds.client.ms.farend.1day.ES	864	0	86400
MXP-2_5G-10E.pmthresholds.client.ms.farend.1day.SES	4	0	86400
MXP-2_5G-10E.pmthresholds.client.ms.farend.1day.UAS	10	0	86400
MXP-2_5G-10E.pmthresholds.client.ms.nearend.15min.BBE	21260	0	2212200
MXP-2_5G-10E.pmthresholds.client.ms.nearend.15min.EB	21260	0	2212200
MXP-2_5G-10E.pmthresholds.client.ms.nearend.15min.ES	87	0	900
MXP-2_5G-10E.pmthresholds.client.ms.nearend.15min.SES	1	0	900
MXP-2_5G-10E.pmthresholds.client.ms.nearend.15min.UAS	3	0	900
MXP-2_5G-10E.pmthresholds.client.ms.nearend.1day.BBE	212600	0	212371200
MXP-2_5G-10E.pmthresholds.client.ms.nearend.1day.EB	212600	0	212371200
MXP-2_5G-10E.pmthresholds.client.ms.nearend.1day.ES	864	0	86400
MXP-2_5G-10E.pmthresholds.client.ms.nearend.1day.SES	4	0	86400
MXP-2_5G-10E.pmthresholds.client.ms.nearend.1day.UAS	10	0	86400
MXP-2_5G-10E.pmthresholds.client.rs.nearend.15min.BBE	10000	0	2212200
MXP-2_5G-10E.pmthresholds.client.rs.nearend.15min.EB	10000	0	2151900
MXP-2_5G-10E.pmthresholds.client.rs.nearend.15min.ES	500	0	900
MXP-2_5G-10E.pmthresholds.client.rs.nearend.15min.SES	500	0	900
MXP-2_5G-10E.pmthresholds.client.rs.nearend.15min.UAS	500	0	900
MXP-2_5G-10E.pmthresholds.client.rs.nearend.1day.BBE	100000	0	212371200
MXP-2_5G-10E.pmthresholds.client.rs.nearend.1day.EB	100000	0	206582400
MXP-2_5G-10E.pmthresholds.client.rs.nearend.1day.ES	5000	0	86400
MXP-2_5G-10E.pmthresholds.client.rs.nearend.1day.SES	5000	0	86400
MXP-2_5G-10E.pmthresholds.client.rs.nearend.1day.UAS	5000	0	86400

## C.2.16 MXP\_MR\_2.5G Card Default Settings

Table C-16 lists the MXP\_MR\_2.5G card default settings.

**Table C-16** MXP-MR-2.5G Card Default Settings

Default Name	Default Value	Minimum	Maximum
MXP-MR-2_5G.config.client.AlsMode	Disabled		
MXP-MR-2_5G.config.client.AlsRecoveryPulseDuration	4		
MXP-MR-2_5G.config.client.AlsRecoveryPulseInterval	100	60	300
MXP-MR-2_5G.config.client.ppmPortAssignment	UNASSIGNED		
MXP-MR-2_5G.config.client.ppmSlotAssignment	UNASSIGNED		

Table C-16 MXP-MR-2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-MR-2_5G.config.fc.distanceExtension.AutoadjustGFPBufferThreshold	TRUE		
MXP-MR-2_5G.config.fc.distanceExtension.AutoDetect	TRUE		
MXP-MR-2_5G.config.fc.distanceExtension.Enabled	TRUE		
MXP-MR-2_5G.config.fc.distanceExtension.NumCredits	32	2	256
MXP-MR-2_5G.config.fc.distanceExtension.NumGFPBuffers	16		
MXP-MR-2_5G.config.fc.enhancedFibreChannelFicon.MaxFrameSize	2148		
MXP-MR-2_5G.config.trunk.AINSSoakTime	0.333333333333		
MXP-MR-2_5G.config.trunk.AIsMode	Disabled		
MXP-MR-2_5G.config.trunk.AIsRecoveryPulseDuration	4		
MXP-MR-2_5G.config.trunk.AIsRecoveryPulseInterval	100	60	300
MXP-MR-2_5G.config.trunk.SDBER	1e-007		
MXP-MR-2_5G.config.trunk.SendDoNotUse	FALSE		
MXP-MR-2_5G.config.trunk.SFBER	0.0001		
MXP-MR-2_5G.config.trunk.SyncMsgIn	TRUE		
MXP-MR-2_5G.opticalthresholds.client.alarm.HighLaserBias	90		
MXP-MR-2_5G.opticalthresholds.client.alarm.HighRxPower	3		
MXP-MR-2_5G.opticalthresholds.client.alarm.HighTxPower	3		
MXP-MR-2_5G.opticalthresholds.client.alarm.LowRxPower	-21		
MXP-MR-2_5G.opticalthresholds.client.alarm.LowTxPower	-8		
MXP-MR-2_5G.opticalthresholds.client.warning.15min.HighLaserBias	81		
MXP-MR-2_5G.opticalthresholds.client.warning.15min.HighRxPower	2		
MXP-MR-2_5G.opticalthresholds.client.warning.15min.HighTxPower	2		
MXP-MR-2_5G.opticalthresholds.client.warning.15min.LowRxPower	-20		
MXP-MR-2_5G.opticalthresholds.client.warning.15min.LowTxPower	-7		
MXP-MR-2_5G.opticalthresholds.client.warning.1day.HighLaserBias	85.5		
MXP-MR-2_5G.opticalthresholds.client.warning.1day.HighRxPower	2.5		
MXP-MR-2_5G.opticalthresholds.client.warning.1day.HighTxPower	2.5		
MXP-MR-2_5G.opticalthresholds.client.warning.1day.LowRxPower	-20.5		
MXP-MR-2_5G.opticalthresholds.client.warning.1day.LowTxPower	-7.5		
MXP-MR-2_5G.opticalthresholds.trunk.alarm.HighLaserBias	98		
MXP-MR-2_5G.opticalthresholds.trunk.alarm.HighRxPower	-7		
MXP-MR-2_5G.opticalthresholds.trunk.alarm.HighTxPower	30		
MXP-MR-2_5G.opticalthresholds.trunk.alarm.LowRxPower	-25		
MXP-MR-2_5G.opticalthresholds.trunk.alarm.LowTxPower	-40		
MXP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighLaserBias	95		



Table C-16 MXP-MR-2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighRxPower	-7.5		
MXP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighTxPower	30		
MXP-MR-2_5G.opticalthresholds.trunk.warning.15min.LowRxPower	-24.5		
MXP-MR-2_5G.opticalthresholds.trunk.warning.15min.LowTxPower	-40		
MXP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighLaserBias	96		
MXP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighRxPower	-7.3		
MXP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighTxPower	30		
MXP-MR-2_5G.opticalthresholds.trunk.warning.1day.LowRxPower	-24.7		
MXP-MR-2_5G.opticalthresholds.trunk.warning.1day.LowTxPower	-40		
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.BBE	21260	0	2212200
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.EB	21260	0	2212200
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.ES	87	0	900
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.SES	1	0	900
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.UAS	3	0	900
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.BBE	212600	0	2212200
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.EB	212600	0	212371200
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.ES	864	0	86400
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.SES	4	0	86400
MXP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.UAS	10	0	86400
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.BBE	21260	0	2212200
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.EB	21260	0	2212200
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.ES	87	0	900
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.SES	1	0	900
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.UAS	3	0	900
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.BBE	212600	0	2212200
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.EB	212600	0	212371200
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.ES	864	0	86400
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.SES	4	0	86400
MXP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.UAS	10	0	86400
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.BBE	10000	0	2151900
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.EB	10000	0	2151900
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.ES	500	0	900
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.SES	500	0	900
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.UAS	500	0	900
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.BBE	100000	0	206582400
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.EB	100000	0	206582400

**Table C-16** MXP-MR-2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.ES	5000	0	86400
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.SES	5000	0	86400
MXP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.UAS	5000	0	86400

## C.2.17 MXPP\_MR\_2.5G Card Default Settings

Table C-17 lists the MXPP\_MR\_2.5G card default settings.

**Table C-17** MXPP-MR-2.5G Card Default Settings

Default Name	Default Value	Minimum	Maximum
MXPP-MR-2_5G.config.client.AlsMode	Disabled		
MXPP-MR-2_5G.config.client.AlsRecoveryPulseDuration	4		
MXPP-MR-2_5G.config.client.AlsRecoveryPulseInterval	100	60	300
MXPP-MR-2_5G.config.client.ppmPortAssignment	UNASSIGNED		
MXPP-MR-2_5G.config.client.ppmSlotAssignment	UNASSIGNED		
MXPP-MR-2_5G.config.fc.distanceExtension.AutoadjustGFPB ufferThreshold	TRUE		
MXPP-MR-2_5G.config.fc.distanceExtension.AutoDetect	TRUE		
MXPP-MR-2_5G.config.fc.distanceExtension.Enabled	TRUE		
MXPP-MR-2_5G.config.fc.distanceExtension.NumCredits	32	2	256
MXPP-MR-2_5G.config.fc.distanceExtension.NumGFPBuffers	16		
MXPP-MR-2_5G.config.fc.enhancedFibreChannelFicon.MaxFr ameSize	2148		
MXPP-MR-2_5G.config.trunk.AINSSoakTime	0.333333333333		
MXPP-MR-2_5G.config.trunk.AlsMode	Disabled		
MXPP-MR-2_5G.config.trunk.AlsRecoveryPulseDuration	4		
MXPP-MR-2_5G.config.trunk.AlsRecoveryPulseInterval	100	60	300
MXPP-MR-2_5G.config.trunk.SDBER	1e-007		
MXPP-MR-2_5G.config.trunk.SFBER	0.0001		
MXPP-MR-2_5G.opticalthresholds.client.alarm.HighLaserBias	90		
MXPP-MR-2_5G.opticalthresholds.client.alarm.HighRxPower	3		
MXPP-MR-2_5G.opticalthresholds.client.alarm.HighTxPower	3		
MXPP-MR-2_5G.opticalthresholds.client.alarm.LowRxPower	-21		
MXPP-MR-2_5G.opticalthresholds.client.alarm.LowTxPower	-8		
MXPP-MR-2_5G.opticalthresholds.client.warning.15min.HighL aserBias	81		

Table C-17 MXPP-MR-2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXPP-MR-2_5G.opticalthresholds.client.warning.15min.HighRxPower	2		
MXPP-MR-2_5G.opticalthresholds.client.warning.15min.HighTxPower	2		
MXPP-MR-2_5G.opticalthresholds.client.warning.15min.LowRxPower	-20		
MXPP-MR-2_5G.opticalthresholds.client.warning.15min.LowTxPower	-7		
MXPP-MR-2_5G.opticalthresholds.client.warning.1day.HighLaserBias	85.5		
MXPP-MR-2_5G.opticalthresholds.client.warning.1day.HighRxPower	2.5		
MXPP-MR-2_5G.opticalthresholds.client.warning.1day.HighTxPower	2.5		
MXPP-MR-2_5G.opticalthresholds.client.warning.1day.LowRxPower	-20.5		
MXPP-MR-2_5G.opticalthresholds.client.warning.1day.LowTxPower	-7.5		
MXPP-MR-2_5G.opticalthresholds.trunk.alarm.HighLaserBias	98		
MXPP-MR-2_5G.opticalthresholds.trunk.alarm.HighRxPower	-7		
MXPP-MR-2_5G.opticalthresholds.trunk.alarm.HighTxPower	30		
MXPP-MR-2_5G.opticalthresholds.trunk.alarm.LowRxPower	-25		
MXPP-MR-2_5G.opticalthresholds.trunk.alarm.LowTxPower	-40		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighLaserBias	95		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighRxPower	-7.5		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighTxPower	30		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.15min.LowRxPower	-24.5		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.15min.LowTxPower	-40		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighLaserBias	96		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighRxPower	-7.3		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighTxPower	30		
MXPP-MR-2_5G.opticalthresholds.trunk.warning.1day.LowRxPower	-24.7		

Table C-17 MXPP-MR-2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
MXPP-MR-2_5G.opticalthresholds.trunk.warning.1day.LowTxPower	-40		
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.BBE	21260	0	2212200
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.EB	21260	0	2212200
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.ES	87	0	900
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.SES	1	0	900
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.15min.UAS	3	0	900
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.BBE	212600	0	2212200
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.EB	212600	0	212371200
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.ES	864	0	86400
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.SES	4	0	86400
MXPP-MR-2_5G.pmthresholds.trunk.ms.farend.1day.UAS	10	0	86400
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.BBE	21260	0	2212200
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.EB	21260	0	2212200
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.ES	87	0	900
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.SES	1	0	900
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.15min.UAS	3	0	900
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.BBE	212600	0	2212200
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.EB	212600	0	212371200
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.ES	864	0	86400
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.SES	4	0	86400
MXPP-MR-2_5G.pmthresholds.trunk.ms.nearend.1day.UAS	10	0	86400
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.BBE	10000	0	2151900
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.EB	10000	0	2151900
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.ES	500	0	900
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.SES	500	0	900
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.15min.UAS	500	0	900
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.BBE	100000	0	206582400
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.EB	100000	0	206582400
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.ES	5000	0	86400
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.SES	5000	0	86400
MXPP-MR-2_5G.pmthresholds.trunk.rs.nearend.1day.UAS	5000	0	86400

## C.2.18 TXP\_MR\_10E Card Default Settings

Table C-18 lists the TXP\_MR\_10E card default settings.

**Table C-18** TXP\_MR\_10E Card Default Settings

Default Name	Default Value	Minimum	Maximum
TXP-MR-10E.config.client.AINSSoakTime	0.333333333333		
TXP-MR-10E.config.client.AisSquelchMode	Squelch		
TXP-MR-10E.config.client.AisMode	Disabled		
TXP-MR-10E.config.client.AisRecoveryPulseDuration	2		
TXP-MR-10E.config.client.AisRecoveryPulseInterval	100	100	2000
TXP-MR-10E.config.client.ppmPortAssignment	UNASSIGNED		
TXP-MR-10E.config.client.ppmSlotAssignment	UNASSIGNED		
TXP-MR-10E.config.client.SDBER	1e-007		
TXP-MR-10E.config.client.SendDoNotUse	FALSE		
TXP-MR-10E.config.client.SFBER	0.0001		
TXP-MR-10E.config.client.SyncMsgIn	TRUE		
TXP-MR-10E.config.client.TerminationMode	Transparent		
TXP-MR-10E.config.trunk.AINSSoakTime	0.333333333333		
TXP-MR-10E.config.trunk.AisMode	Disabled		
TXP-MR-10E.config.trunk.AisRecoveryPulseDuration	100		
TXP-MR-10E.config.trunk.AisRecoveryPulseInterval	300	200	2000
TXP-MR-10E.config.trunk.SDBER	1e-007		
TXP-MR-10E.config.trunk.SFBER	0.0001		
TXP-MR-10E.opticalthresholds.client.alarm.HighLaserBias	90		
TXP-MR-10E.opticalthresholds.client.alarm.HighRxPower	2		
TXP-MR-10E.opticalthresholds.client.alarm.HighTxPower	2		
TXP-MR-10E.opticalthresholds.client.alarm.LowRxPower	-17		
TXP-MR-10E.opticalthresholds.client.alarm.LowTxPower	-9		
TXP-MR-10E.opticalthresholds.client.warning.15min.HighLaserBias	81		
TXP-MR-10E.opticalthresholds.client.warning.15min.HighRxPower	1		
TXP-MR-10E.opticalthresholds.client.warning.15min.HighTxPower	1		
TXP-MR-10E.opticalthresholds.client.warning.15min.LowRxPower	-16		
TXP-MR-10E.opticalthresholds.client.warning.15min.LowTxPower	-8		
TXP-MR-10E.opticalthresholds.client.warning.1day.HighLaserBias	85.5		
TXP-MR-10E.opticalthresholds.client.warning.1day.HighRxPower	1.5		

Table C-18 TXP\_MR\_10E Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10E.opticalthresholds.client.warning.1day.HighTxPower	1.5		
TXP-MR-10E.opticalthresholds.client.warning.1day.LowRxPower	-16.5		
TXP-MR-10E.opticalthresholds.client.warning.1day.LowTxPower	-8.5		
TXP-MR-10E.opticalthresholds.trunk.alarm.HighLaserBias	98		
TXP-MR-10E.opticalthresholds.trunk.alarm.HighRxPower	-7		
TXP-MR-10E.opticalthresholds.trunk.alarm.HighTxPower	8		
TXP-MR-10E.opticalthresholds.trunk.alarm.LowRxPower	-25		
TXP-MR-10E.opticalthresholds.trunk.alarm.LowTxPower	1		
TXP-MR-10E.opticalthresholds.trunk.warning.15min.HighLaserBias	95		
TXP-MR-10E.opticalthresholds.trunk.warning.15min.HighRxPower	-7.5		
TXP-MR-10E.opticalthresholds.trunk.warning.15min.HighTxPower	7		
TXP-MR-10E.opticalthresholds.trunk.warning.15min.LowRxPower	-24.5		
TXP-MR-10E.opticalthresholds.trunk.warning.15min.LowTxPower	2		
TXP-MR-10E.opticalthresholds.trunk.warning.1day.HighLaserBias	96		
TXP-MR-10E.opticalthresholds.trunk.warning.1day.HighRxPower	-7.3		
TXP-MR-10E.opticalthresholds.trunk.warning.1day.HighTxPower	7		
TXP-MR-10E.opticalthresholds.trunk.warning.1day.LowRxPower	-24.7		
TXP-MR-10E.opticalthresholds.trunk.warning.1day.LowTxPower	2		
TXP-MR-10E.otn.fecthresholds.enhanced.15min.BitErrorsCorrected	903330	0	903362181120 0
TXP-MR-10E.otn.fecthresholds.enhanced.15min.UncorrectableWords	5	0	4724697600
TXP-MR-10E.otn.fecthresholds.enhanced.1day.BitErrorsCorrected	86719680	0	867227693875 200
TXP-MR-10E.otn.fecthresholds.enhanced.1day.UncorrectableWords	480	0	453570969600
TXP-MR-10E.otn.fecthresholds.standard.15min.BitErrorsCorrected	903330	0	903362181120 0
TXP-MR-10E.otn.fecthresholds.standard.15min.UncorrectableWords	5	0	4724697600
TXP-MR-10E.otn.fecthresholds.standard.1day.BitErrorsCorrected	86719680	0	867227693875 200
TXP-MR-10E.otn.fecthresholds.standard.1day.UncorrectableWords	480	0	453570969600
TXP-MR-10E.otn.g709thresholds.pm.farend.15min.BBE	85040	0	8850600
TXP-MR-10E.otn.g709thresholds.pm.farend.15min.ES	87	0	900
TXP-MR-10E.otn.g709thresholds.pm.farend.15min.FC	10	0	72
TXP-MR-10E.otn.g709thresholds.pm.farend.15min.SES	1	0	900
TXP-MR-10E.otn.g709thresholds.pm.farend.15min.UAS	3	0	900
TXP-MR-10E.otn.g709thresholds.pm.farend.1day.BBE	850400	0	849657600
TXP-MR-10E.otn.g709thresholds.pm.farend.1day.ES	864	0	86400

Table C-18 TXP\_MR\_10E Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10E.otn.g709thresholds.pm.farend.1day.FC	40	0	6912
TXP-MR-10E.otn.g709thresholds.pm.farend.1day.SES	4	0	86400
TXP-MR-10E.otn.g709thresholds.pm.farend.1day.UAS	10	0	86400
TXP-MR-10E.otn.g709thresholds.pm.nearend.15min.BBE	85040	0	8850600
TXP-MR-10E.otn.g709thresholds.pm.nearend.15min.ES	87	0	900
TXP-MR-10E.otn.g709thresholds.pm.nearend.15min.FC	10	0	72
TXP-MR-10E.otn.g709thresholds.pm.nearend.15min.SES	1	0	900
TXP-MR-10E.otn.g709thresholds.pm.nearend.15min.UAS	3	0	900
TXP-MR-10E.otn.g709thresholds.pm.nearend.1day.BBE	850400	0	849657600
TXP-MR-10E.otn.g709thresholds.pm.nearend.1day.ES	864	0	86400
TXP-MR-10E.otn.g709thresholds.pm.nearend.1day.FC	40	0	6912
TXP-MR-10E.otn.g709thresholds.pm.nearend.1day.SES	4	0	86400
TXP-MR-10E.otn.g709thresholds.pm.nearend.1day.UAS	10	0	86400
TXP-MR-10E.otn.g709thresholds.sm.farend.15min.BBE	10000	0	8850600
TXP-MR-10E.otn.g709thresholds.sm.farend.15min.ES	500	0	900
TXP-MR-10E.otn.g709thresholds.sm.farend.15min.FC	10	0	72
TXP-MR-10E.otn.g709thresholds.sm.farend.15min.SES	500	0	900
TXP-MR-10E.otn.g709thresholds.sm.farend.15min.UAS	500	0	900
TXP-MR-10E.otn.g709thresholds.sm.farend.1day.BBE	100000	0	849657600
TXP-MR-10E.otn.g709thresholds.sm.farend.1day.ES	5000	0	86400
TXP-MR-10E.otn.g709thresholds.sm.farend.1day.FC	40	0	6912
TXP-MR-10E.otn.g709thresholds.sm.farend.1day.SES	5000	0	86400
TXP-MR-10E.otn.g709thresholds.sm.farend.1day.UAS	5000	0	86400
TXP-MR-10E.otn.g709thresholds.sm.nearend.15min.BBE	10000	0	8850600
TXP-MR-10E.otn.g709thresholds.sm.nearend.15min.ES	500	0	900
TXP-MR-10E.otn.g709thresholds.sm.nearend.15min.FC	10	0	72
TXP-MR-10E.otn.g709thresholds.sm.nearend.15min.SES	500	0	900
TXP-MR-10E.otn.g709thresholds.sm.nearend.15min.UAS	500	0	900
TXP-MR-10E.otn.g709thresholds.sm.nearend.1day.BBE	100000	0	849657600
TXP-MR-10E.otn.g709thresholds.sm.nearend.1day.ES	5000	0	86400
TXP-MR-10E.otn.g709thresholds.sm.nearend.1day.FC	40	0	6912
TXP-MR-10E.otn.g709thresholds.sm.nearend.1day.SES	5000	0	86400
TXP-MR-10E.otn.g709thresholds.sm.nearend.1day.UAS	5000	0	86400
TXP-MR-10E.otn.otnLines.AsynchSynchMapping	Synch Mapping		
TXP-MR-10E.otn.otnLines.FEC	Standard		

Table C-18 TXP\_MR\_10E Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10E.otn.otnLines.G709OTN	TRUE		
TXP-MR-10E.otn.otnLines.SDBER	1e-007		
TXP-MR-10E.pmthresholds.client.ms.farend.15min.BBE	85040	0	8850600
TXP-MR-10E.pmthresholds.client.ms.farend.15min.EB	85040	0	8850600
TXP-MR-10E.pmthresholds.client.ms.farend.15min.ES	87	0	900
TXP-MR-10E.pmthresholds.client.ms.farend.15min.SES	1	0	900
TXP-MR-10E.pmthresholds.client.ms.farend.15min.UAS	3	0	900
TXP-MR-10E.pmthresholds.client.ms.farend.1day.BBE	850400	0	849657600
TXP-MR-10E.pmthresholds.client.ms.farend.1day.EB	850400	0	849657600
TXP-MR-10E.pmthresholds.client.ms.farend.1day.ES	864	0	86400
TXP-MR-10E.pmthresholds.client.ms.farend.1day.SES	4	0	86400
TXP-MR-10E.pmthresholds.client.ms.farend.1day.UAS	10	0	86400
TXP-MR-10E.pmthresholds.client.ms.nearend.15min.BBE	85040	0	8850600
TXP-MR-10E.pmthresholds.client.ms.nearend.15min.EB	85040	0	8850600
TXP-MR-10E.pmthresholds.client.ms.nearend.15min.ES	87	0	900
TXP-MR-10E.pmthresholds.client.ms.nearend.15min.SES	1	0	900
TXP-MR-10E.pmthresholds.client.ms.nearend.15min.UAS	3	0	900
TXP-MR-10E.pmthresholds.client.ms.nearend.1day.BBE	850400	0	849657600
TXP-MR-10E.pmthresholds.client.ms.nearend.1day.EB	850400	0	849657600
TXP-MR-10E.pmthresholds.client.ms.nearend.1day.ES	864	0	86400
TXP-MR-10E.pmthresholds.client.ms.nearend.1day.SES	4	0	86400
TXP-MR-10E.pmthresholds.client.ms.nearend.1day.UAS	10	0	86400
TXP-MR-10E.pmthresholds.client.rs.nearend.15min.BBE	10000	0	8850600
TXP-MR-10E.pmthresholds.client.rs.nearend.15min.EB	10000	0	7967700
TXP-MR-10E.pmthresholds.client.rs.nearend.15min.ES	500	0	900
TXP-MR-10E.pmthresholds.client.rs.nearend.15min.SES	500	0	900
TXP-MR-10E.pmthresholds.client.rs.nearend.15min.UAS	500	0	900
TXP-MR-10E.pmthresholds.client.rs.nearend.1day.BBE	100000	0	849657600
TXP-MR-10E.pmthresholds.client.rs.nearend.1day.EB	100000	0	764899200
TXP-MR-10E.pmthresholds.client.rs.nearend.1day.ES	5000	0	86400
TXP-MR-10E.pmthresholds.client.rs.nearend.1day.SES	5000	0	86400
TXP-MR-10E.pmthresholds.client.rs.nearend.1day.UAS	5000	0	86400
TXP-MR-10E.pmthresholds.trunk.ms.farend.15min.BBE	85040	0	8850600
TXP-MR-10E.pmthresholds.trunk.ms.farend.15min.EB	85040	0	8850600
TXP-MR-10E.pmthresholds.trunk.ms.farend.15min.ES	87	0	900
TXP-MR-10E.pmthresholds.trunk.ms.farend.15min.SES	1	0	900



**Table C-18** TXP\_MR\_10E Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10E.pmthresholds.trunk.ms.farend.15min.UAS	3	0	900
TXP-MR-10E.pmthresholds.trunk.ms.farend.1day.BBE	850400	0	849657600
TXP-MR-10E.pmthresholds.trunk.ms.farend.1day.EB	850400	0	849657600
TXP-MR-10E.pmthresholds.trunk.ms.farend.1day.ES	864	0	86400
TXP-MR-10E.pmthresholds.trunk.ms.farend.1day.SES	4	0	86400
TXP-MR-10E.pmthresholds.trunk.ms.farend.1day.UAS	10	0	86400
TXP-MR-10E.pmthresholds.trunk.ms.nearend.15min.BBE	85040	0	8850600
TXP-MR-10E.pmthresholds.trunk.ms.nearend.15min.EB	85040	0	8850600
TXP-MR-10E.pmthresholds.trunk.ms.nearend.15min.ES	87	0	900
TXP-MR-10E.pmthresholds.trunk.ms.nearend.15min.SES	1	0	900
TXP-MR-10E.pmthresholds.trunk.ms.nearend.15min.UAS	3	0	900
TXP-MR-10E.pmthresholds.trunk.ms.nearend.1day.BBE	850400	0	849657600
TXP-MR-10E.pmthresholds.trunk.ms.nearend.1day.EB	850400	0	849657600
TXP-MR-10E.pmthresholds.trunk.ms.nearend.1day.ES	864	0	86400
TXP-MR-10E.pmthresholds.trunk.ms.nearend.1day.SES	4	0	86400
TXP-MR-10E.pmthresholds.trunk.ms.nearend.1day.UAS	10	0	86400
TXP-MR-10E.pmthresholds.trunk.rs.nearend.15min.BBE	10000	0	8850600
TXP-MR-10E.pmthresholds.trunk.rs.nearend.15min.EB	10000	0	7967700
TXP-MR-10E.pmthresholds.trunk.rs.nearend.15min.ES	500	0	900
TXP-MR-10E.pmthresholds.trunk.rs.nearend.15min.SES	500	0	900
TXP-MR-10E.pmthresholds.trunk.rs.nearend.15min.UAS	500	0	900
TXP-MR-10E.pmthresholds.trunk.rs.nearend.1day.BBE	100000	0	849657600
TXP-MR-10E.pmthresholds.trunk.rs.nearend.1day.EB	100000	0	764899200
TXP-MR-10E.pmthresholds.trunk.rs.nearend.1day.ES	5000	0	86400
TXP-MR-10E.pmthresholds.trunk.rs.nearend.1day.SES	5000	0	86400
TXP-MR-10E.pmthresholds.trunk.rs.nearend.1day.UAS	5000	0	86400

## C.2.19 TXP\_MR\_10G Card Default Settings

Table C-19 lists the TXP\_MR\_10G card default settings.

**Table C-19** TXP\_MR\_10G Card Default Settings

Default Name	Default Value	Minimum	Maximum
TXP-MR-10G.config.client.AINSSoakTime	0.333333333333		
TXP-MR-10G.config.client.AlsMode	Disabled		
TXP-MR-10G.config.client.AlsRecoveryPulseDuration	4		

Table C-19 TXP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10G.config.client.AlsRecoveryPulseInterval	100	100	300
TXP-MR-10G.config.client.mrPortAssignment	UNASSIGNED		
TXP-MR-10G.config.client.SDBER	1e-007		
TXP-MR-10G.config.client.SFBER	0.0001		
TXP-MR-10G.config.client.TerminationMode	Transparent		
TXP-MR-10G.config.trunk.AINSSoakTime	0.3333333333		
TXP-MR-10G.config.trunk.AlsMode	Disabled		
TXP-MR-10G.config.trunk.AlsRecoveryPulseDuration	4		
TXP-MR-10G.config.trunk.AlsRecoveryPulseInterval	100	60	300
TXP-MR-10G.config.trunk.SDBER	1e-007		
TXP-MR-10G.config.trunk.SFBER	0.0001		
TXP-MR-10G.opticalthresholds.client.alarm.HighLaserBias	90		
TXP-MR-10G.opticalthresholds.client.alarm.HighRxPower	2		
TXP-MR-10G.opticalthresholds.client.alarm.HighTxPower	2		
TXP-MR-10G.opticalthresholds.client.alarm.LowRxPower	-17		
TXP-MR-10G.opticalthresholds.client.alarm.LowTxPower	-9		
TXP-MR-10G.opticalthresholds.client.warning.15min.HighLaserBias	81		
TXP-MR-10G.opticalthresholds.client.warning.15min.HighRxPower	1		
TXP-MR-10G.opticalthresholds.client.warning.15min.HighTxPower	1		
TXP-MR-10G.opticalthresholds.client.warning.15min.LowRxPower	-16		
TXP-MR-10G.opticalthresholds.client.warning.15min.LowTxPower	-8		
TXP-MR-10G.opticalthresholds.client.warning.1day.HighLaserBias	85.5		
TXP-MR-10G.opticalthresholds.client.warning.1day.HighRxPower	1.5		
TXP-MR-10G.opticalthresholds.client.warning.1day.HighTxPower	1.5		
TXP-MR-10G.opticalthresholds.client.warning.1day.LowRxPower	-16.5		
TXP-MR-10G.opticalthresholds.client.warning.1day.LowTxPower	-8.5		
TXP-MR-10G.opticalthresholds.trunk.alarm.HighLaserBias	90		
TXP-MR-10G.opticalthresholds.trunk.alarm.HighRxPower	-7		
TXP-MR-10G.opticalthresholds.trunk.alarm.HighTxPower	4		
TXP-MR-10G.opticalthresholds.trunk.alarm.LowRxPower	-25		
TXP-MR-10G.opticalthresholds.trunk.alarm.LowTxPower	2		
TXP-MR-10G.opticalthresholds.trunk.warning.15min.HighLaserBias	81		
TXP-MR-10G.opticalthresholds.trunk.warning.15min.HighRxPower	-7.5		
TXP-MR-10G.opticalthresholds.trunk.warning.15min.HighTxPower	3.5		
TXP-MR-10G.opticalthresholds.trunk.warning.15min.LowRxPower	-24.5		
TXP-MR-10G.opticalthresholds.trunk.warning.15min.LowTxPower	2.5		

Table C-19 TXP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10G.opticalthresholds.trunk.warning.1day.HighLaserBias	85.5		
TXP-MR-10G.opticalthresholds.trunk.warning.1day.HighRxPower	-7.3		
TXP-MR-10G.opticalthresholds.trunk.warning.1day.HighTxPower	3.7		
TXP-MR-10G.opticalthresholds.trunk.warning.1day.LowRxPower	-24.7		
TXP-MR-10G.opticalthresholds.trunk.warning.1day.LowTxPower	2.3		
TXP-MR-10G.otn.fecthresholds.standard.15min.BitErrorsCorrected	903330	0	9033621811200
TXP-MR-10G.otn.fecthresholds.standard.15min.UncorrectableWords	5	0	4724697600
TXP-MR-10G.otn.fecthresholds.standard.1day.BitErrorsCorrected	86719680	0	867227693875200
TXP-MR-10G.otn.fecthresholds.standard.1day.UncorrectableWords	480	0	453570969600
TXP-MR-10G.otn.g709thresholds.pm.farend.15min.BBE	85040	0	8850600
TXP-MR-10G.otn.g709thresholds.pm.farend.15min.ES	87	0	900
TXP-MR-10G.otn.g709thresholds.pm.farend.15min.FC	10	0	72
TXP-MR-10G.otn.g709thresholds.pm.farend.15min.SES	1	0	900
TXP-MR-10G.otn.g709thresholds.pm.farend.15min.UAS	3	0	900
TXP-MR-10G.otn.g709thresholds.pm.farend.1day.BBE	850400	0	849657600
TXP-MR-10G.otn.g709thresholds.pm.farend.1day.ES	864	0	86400
TXP-MR-10G.otn.g709thresholds.pm.farend.1day.FC	40	0	6912
TXP-MR-10G.otn.g709thresholds.pm.farend.1day.SES	4	0	86400
TXP-MR-10G.otn.g709thresholds.pm.farend.1day.UAS	10	0	86400
TXP-MR-10G.otn.g709thresholds.pm.nearend.15min.BBE	85040	0	8850600
TXP-MR-10G.otn.g709thresholds.pm.nearend.15min.ES	87	0	900
TXP-MR-10G.otn.g709thresholds.pm.nearend.15min.FC	10	0	72
TXP-MR-10G.otn.g709thresholds.pm.nearend.15min.SES	1	0	900
TXP-MR-10G.otn.g709thresholds.pm.nearend.15min.UAS	3	0	900
TXP-MR-10G.otn.g709thresholds.pm.nearend.1day.BBE	850400	0	849657600
TXP-MR-10G.otn.g709thresholds.pm.nearend.1day.ES	864	0	86400
TXP-MR-10G.otn.g709thresholds.pm.nearend.1day.FC	40	0	6912
TXP-MR-10G.otn.g709thresholds.pm.nearend.1day.SES	4	0	86400
TXP-MR-10G.otn.g709thresholds.pm.nearend.1day.UAS	10	0	86400
TXP-MR-10G.otn.g709thresholds.sm.farend.15min.BBE	10000	0	8850600
TXP-MR-10G.otn.g709thresholds.sm.farend.15min.ES	500	0	900
TXP-MR-10G.otn.g709thresholds.sm.farend.15min.FC	10	0	72
TXP-MR-10G.otn.g709thresholds.sm.farend.15min.SES	500	0	900
TXP-MR-10G.otn.g709thresholds.sm.farend.15min.UAS	500	0	900

Table C-19 TXP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10G.otn.g709thresholds.sm.farend.1day.BBE	100000	0	849657600
TXP-MR-10G.otn.g709thresholds.sm.farend.1day.ES	5000	0	86400
TXP-MR-10G.otn.g709thresholds.sm.farend.1day.FC	40	0	6912
TXP-MR-10G.otn.g709thresholds.sm.farend.1day.SES	5000	0	86400
TXP-MR-10G.otn.g709thresholds.sm.farend.1day.UAS	5000	0	86400
TXP-MR-10G.otn.g709thresholds.sm.nearend.15min.BBE	10000	0	8850600
TXP-MR-10G.otn.g709thresholds.sm.nearend.15min.ES	500	0	900
TXP-MR-10G.otn.g709thresholds.sm.nearend.15min.FC	10	0	72
TXP-MR-10G.otn.g709thresholds.sm.nearend.15min.SES	500	0	900
TXP-MR-10G.otn.g709thresholds.sm.nearend.15min.UAS	500	0	900
TXP-MR-10G.otn.g709thresholds.sm.nearend.1day.BBE	100000	0	849657600
TXP-MR-10G.otn.g709thresholds.sm.nearend.1day.ES	5000	0	86400
TXP-MR-10G.otn.g709thresholds.sm.nearend.1day.FC	40	0	6912
TXP-MR-10G.otn.g709thresholds.sm.nearend.1day.SES	5000	0	86400
TXP-MR-10G.otn.g709thresholds.sm.nearend.1day.UAS	5000	0	86400
TXP-MR-10G.otn.otnLines.FEC	Enable		
TXP-MR-10G.otn.otnLines.G709OTN	TRUE		
TXP-MR-10G.otn.otnLines.SDBER	1e-007		
TXP-MR-10G.pmthresholds.client.ms.farend.15min.BBE	85040	0	8850600
TXP-MR-10G.pmthresholds.client.ms.farend.15min.EB	85040	0	8850600
TXP-MR-10G.pmthresholds.client.ms.farend.15min.ES	87	0	900
TXP-MR-10G.pmthresholds.client.ms.farend.15min.SES	1	0	900
TXP-MR-10G.pmthresholds.client.ms.farend.15min.UAS	3	0	900
TXP-MR-10G.pmthresholds.client.ms.farend.1day.BBE	850400	0	849657600
TXP-MR-10G.pmthresholds.client.ms.farend.1day.EB	850400	0	849657600
TXP-MR-10G.pmthresholds.client.ms.farend.1day.ES	864	0	86400
TXP-MR-10G.pmthresholds.client.ms.farend.1day.SES	4	0	86400
TXP-MR-10G.pmthresholds.client.ms.farend.1day.UAS	10	0	86400
TXP-MR-10G.pmthresholds.client.ms.nearend.15min.BBE	85040	0	8850600
TXP-MR-10G.pmthresholds.client.ms.nearend.15min.EB	85040	0	8850600
TXP-MR-10G.pmthresholds.client.ms.nearend.15min.ES	87	0	900
TXP-MR-10G.pmthresholds.client.ms.nearend.15min.SES	1	0	900
TXP-MR-10G.pmthresholds.client.ms.nearend.15min.UAS	3	0	900
TXP-MR-10G.pmthresholds.client.ms.nearend.1day.BBE	850400	0	849657600
TXP-MR-10G.pmthresholds.client.ms.nearend.1day.EB	850400	0	849657600
TXP-MR-10G.pmthresholds.client.ms.nearend.1day.ES	864	0	86400

Table C-19 TXP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10G.pmthresholds.client.ms.nearend.1day.SES	4	0	86400
TXP-MR-10G.pmthresholds.client.ms.nearend.1day.UAS	10	0	86400
TXP-MR-10G.pmthresholds.client.rs.nearend.15min.BBE	10000	0	8850600
TXP-MR-10G.pmthresholds.client.rs.nearend.15min.EB	10000	0	7967700
TXP-MR-10G.pmthresholds.client.rs.nearend.15min.ES	500	0	900
TXP-MR-10G.pmthresholds.client.rs.nearend.15min.SES	500	0	900
TXP-MR-10G.pmthresholds.client.rs.nearend.15min.UAS	500	0	900
TXP-MR-10G.pmthresholds.client.rs.nearend.1day.BBE	100000	0	849657600
TXP-MR-10G.pmthresholds.client.rs.nearend.1day.EB	100000	0	764899200
TXP-MR-10G.pmthresholds.client.rs.nearend.1day.ES	5000	0	86400
TXP-MR-10G.pmthresholds.client.rs.nearend.1day.SES	5000	0	86400
TXP-MR-10G.pmthresholds.client.rs.nearend.1day.UAS	5000	0	86400
TXP-MR-10G.pmthresholds.trunk.ms.farend.15min.BBE	85040	0	8850600
TXP-MR-10G.pmthresholds.trunk.ms.farend.15min.EB	85040	0	8850600
TXP-MR-10G.pmthresholds.trunk.ms.farend.15min.ES	87	0	900
TXP-MR-10G.pmthresholds.trunk.ms.farend.15min.SES	1	0	900
TXP-MR-10G.pmthresholds.trunk.ms.farend.15min.UAS	3	0	900
TXP-MR-10G.pmthresholds.trunk.ms.farend.1day.BBE	850400	0	849657600
TXP-MR-10G.pmthresholds.trunk.ms.farend.1day.EB	850400	0	849657600
TXP-MR-10G.pmthresholds.trunk.ms.farend.1day.ES	864	0	86400
TXP-MR-10G.pmthresholds.trunk.ms.farend.1day.SES	4	0	86400
TXP-MR-10G.pmthresholds.trunk.ms.farend.1day.UAS	10	0	86400
TXP-MR-10G.pmthresholds.trunk.ms.nearend.15min.BBE	85040	0	8850600
TXP-MR-10G.pmthresholds.trunk.ms.nearend.15min.EB	85040	0	8850600
TXP-MR-10G.pmthresholds.trunk.ms.nearend.15min.ES	87	0	900
TXP-MR-10G.pmthresholds.trunk.ms.nearend.15min.SES	1	0	900
TXP-MR-10G.pmthresholds.trunk.ms.nearend.15min.UAS	3	0	900
TXP-MR-10G.pmthresholds.trunk.ms.nearend.1day.BBE	850400	0	849657600
TXP-MR-10G.pmthresholds.trunk.ms.nearend.1day.EB	850400	0	849657600
TXP-MR-10G.pmthresholds.trunk.ms.nearend.1day.ES	864	0	86400
TXP-MR-10G.pmthresholds.trunk.ms.nearend.1day.SES	4	0	86400
TXP-MR-10G.pmthresholds.trunk.ms.nearend.1day.UAS	10	0	86400
TXP-MR-10G.pmthresholds.trunk.rs.nearend.15min.BBE	10000	0	8850600
TXP-MR-10G.pmthresholds.trunk.rs.nearend.15min.EB	10000	0	7967700
TXP-MR-10G.pmthresholds.trunk.rs.nearend.15min.ES	500	0	900
TXP-MR-10G.pmthresholds.trunk.rs.nearend.15min.SES	500	0	900

**Table C-19** TXP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-10G.pmthresholds.trunk.rs.nearend.15min.UAS	500	0	900
TXP-MR-10G.pmthresholds.trunk.rs.nearend.1day.BBE	100000	0	849657600
TXP-MR-10G.pmthresholds.trunk.rs.nearend.1day.EB	100000	0	764899200
TXP-MR-10G.pmthresholds.trunk.rs.nearend.1day.ES	5000	0	86400
TXP-MR-10G.pmthresholds.trunk.rs.nearend.1day.SES	5000	0	86400
TXP-MR-10G.pmthresholds.trunk.rs.nearend.1day.UAS	5000	0	86400

## C.2.20 TXP\_MR\_2.5G Card Default Settings

Table C-20 lists the TXP\_MR\_2.5G card default settings.

**Table C-20** TXP\_MR\_2.5G Card Default Settings

Default Name	Default Value	Minimum	Maximum
TXP-MR-2_5G.config.client.AINSSoakTime	0.333333333333		
TXP-MR-2_5G.config.client.AlsMode	Disabled		
TXP-MR-2_5G.config.client.AlsRecoveryPulseDuration	40		
TXP-MR-2_5G.config.client.AlsRecoveryPulseInterval	100	60	300
TXP-MR-2_5G.config.client.ppmPortAssignment	UNASSIGNED		
TXP-MR-2_5G.config.client.ppmSlotAssignment	UNASSIGNED		
TXP-MR-2_5G.config.client.SDBER	1e-007		
TXP-MR-2_5G.config.client.SFBER	0.0001		
TXP-MR-2_5G.config.client.TerminationMode	Transparent		
TXP-MR-2_5G.config.trunk.AINSSoakTime	0.333333333333		
TXP-MR-2_5G.config.trunk.AlsMode	Disabled		
TXP-MR-2_5G.config.trunk.AlsRecoveryPulseDuration	40		
TXP-MR-2_5G.config.trunk.AlsRecoveryPulseInterval	100	60	300
TXP-MR-2_5G.config.trunk.SDBER	1e-007		
TXP-MR-2_5G.config.trunk.SFBER	0.0001		
TXP-MR-2_5G.opticalthresholds.client.alarm.HighLaserBias	90		
TXP-MR-2_5G.opticalthresholds.client.alarm.HighRxPower	3		
TXP-MR-2_5G.opticalthresholds.client.alarm.HighTxPower	3		
TXP-MR-2_5G.opticalthresholds.client.alarm.LowRxPower	-21		
TXP-MR-2_5G.opticalthresholds.client.alarm.LowTxPower	-15		
TXP-MR-2_5G.opticalthresholds.client.warning.15min.HighLaserBias	81		
TXP-MR-2_5G.opticalthresholds.client.warning.15min.HighRxPower	2		
TXP-MR-2_5G.opticalthresholds.client.warning.15min.HighTxPower	2		

Table C-20 TXP\_MR\_2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-2_5G.opticalthresholds.client.warning.15min.LowRxPower	-20		
TXP-MR-2_5G.opticalthresholds.client.warning.15min.LowTxPower	-7		
TXP-MR-2_5G.opticalthresholds.client.warning.1day.HighLaserBias	85.5		
TXP-MR-2_5G.opticalthresholds.client.warning.1day.HighRxPower	2.5		
TXP-MR-2_5G.opticalthresholds.client.warning.1day.HighTxPower	2.5		
TXP-MR-2_5G.opticalthresholds.client.warning.1day.LowRxPower	-20.5		
TXP-MR-2_5G.opticalthresholds.client.warning.1day.LowTxPower	-7.5		
TXP-MR-2_5G.opticalthresholds.trunk.alarm.HighLaserBias	98		
TXP-MR-2_5G.opticalthresholds.trunk.alarm.HighRxPower	-7		
TXP-MR-2_5G.opticalthresholds.trunk.alarm.LowRxPower	-25		
TXP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighLaserBias	95		
TXP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighRxPower	-7.5		
TXP-MR-2_5G.opticalthresholds.trunk.warning.15min.LowRxPower	-24.5		
TXP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighLaserBias	96		
TXP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighRxPower	-7.3		
TXP-MR-2_5G.opticalthresholds.trunk.warning.1day.LowRxPower	-24.7		
TXP-MR-2_5G.otn.fec thresholds.1gethernet.15min.BitErrorsCorrected	112500	0	9033621811200
TXP-MR-2_5G.otn.fec thresholds.1gethernet.15min.UncorrectableWords	1	0	4724697600
TXP-MR-2_5G.otn.fec thresholds.1gethernet.1day.BitErrorsCorrected	10800000	0	867227693875200
TXP-MR-2_5G.otn.fec thresholds.1gethernet.1day.UncorrectableWords	96	0	453570969600
TXP-MR-2_5G.otn.fec thresholds.1gfiberchannel.15min.BitErrorsCorrected	90000	0	9033621811200
TXP-MR-2_5G.otn.fec thresholds.1gfiberchannel.15min.UncorrectableWords	1	0	4724697600
TXP-MR-2_5G.otn.fec thresholds.1gfiberchannel.1day.BitErrorsCorrected	8640000	0	867227693875200
TXP-MR-2_5G.otn.fec thresholds.1gfiberchannel.1day.UncorrectableWords	96	0	453570969600
TXP-MR-2_5G.otn.fec thresholds.1gficon.15min.BitErrorsCorrected	90000	0	9033621811200
TXP-MR-2_5G.otn.fec thresholds.1gficon.15min.UncorrectableWords	1	0	4724697600
TXP-MR-2_5G.otn.fec thresholds.1gficon.1day.BitErrorsCorrected	8640000	0	867227693875200
TXP-MR-2_5G.otn.fec thresholds.1gficon.1day.UncorrectableWords	96	0	453570969600
TXP-MR-2_5G.otn.fec thresholds.2gfiberchannel.15min.BitErrorsCorrected	180900	0	9033621811200

Table C-20 TXP\_MR\_2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-2_5G.otn.fecthresholds.2gfiberchannel.15min.Uncorrectable Words	1	0	4724697600
TXP-MR-2_5G.otn.fecthresholds.2gfiberchannel.1day.BitErrorsCorrected	17366400	0	867227693875200
TXP-MR-2_5G.otn.fecthresholds.2gfiberchannel.1day.Uncorrectable Words	96	0	453570969600
TXP-MR-2_5G.otn.fecthresholds.2gficon.15min.BitErrorsCorrected	180900	0	9033621811200
TXP-MR-2_5G.otn.fecthresholds.2gficon.15min.UncorrectableWords	1	0	4724697600
TXP-MR-2_5G.otn.fecthresholds.2gficon.1day.BitErrorsCorrected	17366400	0	867227693875200
TXP-MR-2_5G.otn.fecthresholds.2gficon.1day.UncorrectableWords	96	0	453570969600
TXP-MR-2_5G.otn.fecthresholds.stm1.15min.BitErrorsCorrected	15012	0	9033621811200
TXP-MR-2_5G.otn.fecthresholds.stm1.15min.UncorrectableWords	1	0	4724697600
TXP-MR-2_5G.otn.fecthresholds.stm1.1day.BitErrorsCorrected	1441152	0	867227693875200
TXP-MR-2_5G.otn.fecthresholds.stm1.1day.UncorrectableWords	96	0	453570969600
TXP-MR-2_5G.otn.fecthresholds.stm16.15min.BitErrorsCorrected	225837	0	9033621811200
TXP-MR-2_5G.otn.fecthresholds.stm16.15min.UncorrectableWords	1	0	4724697600
TXP-MR-2_5G.otn.fecthresholds.stm16.1day.BitErrorsCorrected	21680352	0	867227693875200
TXP-MR-2_5G.otn.fecthresholds.stm16.1day.UncorrectableWords	96	0	453570969600
TXP-MR-2_5G.otn.fecthresholds.stm4.15min.BitErrorsCorrected	56457	0	9033621811200
TXP-MR-2_5G.otn.fecthresholds.stm4.15min.UncorrectableWords	1	0	4724697600
TXP-MR-2_5G.otn.fecthresholds.stm4.1day.BitErrorsCorrected	5419872	0	867227693875200
TXP-MR-2_5G.otn.fecthresholds.stm4.1day.UncorrectableWords	96	0	453570969600
TXP-MR-2_5G.otn.g709thresholds.pm.farend.15min.BBE	21260	0	8850600
TXP-MR-2_5G.otn.g709thresholds.pm.farend.15min.ES	87	0	900
TXP-MR-2_5G.otn.g709thresholds.pm.farend.15min.FC	10	0	72
TXP-MR-2_5G.otn.g709thresholds.pm.farend.15min.SES	1	0	900
TXP-MR-2_5G.otn.g709thresholds.pm.farend.15min.UAS	3	0	900
TXP-MR-2_5G.otn.g709thresholds.pm.farend.1day.BBE	212600	0	849657600
TXP-MR-2_5G.otn.g709thresholds.pm.farend.1day.ES	864	0	86400
TXP-MR-2_5G.otn.g709thresholds.pm.farend.1day.FC	40	0	6912
TXP-MR-2_5G.otn.g709thresholds.pm.farend.1day.SES	4	0	86400
TXP-MR-2_5G.otn.g709thresholds.pm.farend.1day.UAS	10	0	86400
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.BBE	21260	0	8850600
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.ES	87	0	900



Table C-20 TXP\_MR\_2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.FC	10	0	72
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.SES	1	0	900
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.UAS	3	0	900
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.BBE	212600	0	849657600
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.ES	864	0	86400
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.FC	40	0	6912
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.SES	4	0	86400
TXP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.UAS	10	0	86400
TXP-MR-2_5G.otn.g709thresholds.sm.farend.15min.BBE	10000	0	8850600
TXP-MR-2_5G.otn.g709thresholds.sm.farend.15min.ES	500	0	900
TXP-MR-2_5G.otn.g709thresholds.sm.farend.15min.FC	10	0	72
TXP-MR-2_5G.otn.g709thresholds.sm.farend.15min.SES	500	0	900
TXP-MR-2_5G.otn.g709thresholds.sm.farend.15min.UAS	500	0	900
TXP-MR-2_5G.otn.g709thresholds.sm.farend.1day.BBE	100000	0	849657600
TXP-MR-2_5G.otn.g709thresholds.sm.farend.1day.ES	5000	0	86400
TXP-MR-2_5G.otn.g709thresholds.sm.farend.1day.FC	40	0	6912
TXP-MR-2_5G.otn.g709thresholds.sm.farend.1day.SES	5000	0	86400
TXP-MR-2_5G.otn.g709thresholds.sm.farend.1day.UAS	5000	0	86400
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.BBE	10000	0	8850600
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.ES	500	0	900
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.FC	10	0	72
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.SES	500	0	900
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.UAS	500	0	900
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.BBE	100000	0	849657600
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.ES	5000	0	86400
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.FC	40	0	6912
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.SES	5000	0	86400
TXP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.UAS	5000	0	86400
TXP-MR-2_5G.otn.otnLines.FEC	Enable		
TXP-MR-2_5G.otn.otnLines.G709OTN	TRUE		
TXP-MR-2_5G.otn.otnLines.SDBER	1e-007		
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.BBE	1312	0	137700
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.EB	1312	0	137700
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.ES	87	0	900
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.SES	1	0	900
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.UAS	3	0	900

Table C-20 TXP\_MR\_2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.BBE	13120	0	13219200
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.EB	13120	0	13219200
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.ES	864	0	86400
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.SES	4	0	86400
TXP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.UAS	10	0	86400
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.BBE	1312	0	137700
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.EB	1312	0	137700
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.ES	87	0	900
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.SES	1	0	900
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.UAS	3	0	900
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.BBE	13120	0	13219200
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.EB	13120	0	13219200
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.ES	864	0	86400
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.SES	4	0	86400
TXP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.UAS	10	0	86400
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.BBE	10000	0	138600
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.EB	10000	0	138600
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.ES	500	0	900
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.SES	500	0	900
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.UAS	500	0	900
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.BBE	10000	0	13305600
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.EB	100000	0	13305600
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.ES	5000	0	86400
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.SES	5000	0	86400
TXP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.UAS	5000	0	86400
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.BBE	21260	0	2212200
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.EB	21260	0	2212200
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.ES	87	0	900
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.SES	1	0	900
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.UAS	3	0	900
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.BBE	212600	0	212371200
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.EB	212600	0	212371200
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.ES	864	0	900
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.SES	4	0	86400
TXP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.UAS	10	0	86400
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.BBE	21260	0	2212200

Table C-20 TXP\_MR\_2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.EB	21260	0	2212200
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.ES	87	0	900
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.SES	1	0	900
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.UAS	3	0	900
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.BBE	212600	0	212371200
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.EB	212600	0	212371200
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.ES	864	0	86400
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.SES	4	0	86400
TXP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.UAS	10	0	86400
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.BBE	10000	0	2151900
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.EB	10000	0	2151900
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.ES	500	0	900
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.SES	500	0	900
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.UAS	500	0	900
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.BBE	10000	0	206582400
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.EB	100000	0	206582400
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.ES	5000	0	86400
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.SES	5000	0	86400
TXP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.UAS	5000	0	86400
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.BBE	5315	0	552600
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.EB	5315	0	552600
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.ES	87	0	900
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.SES	1	0	900
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.UAS	3	0	900
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.BBE	53150	0	53049600
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.EB	53150	0	53049600
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.ES	864	0	86400
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.SES	4	0	86400
TXP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.UAS	10	0	86400
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.BBE	5315	0	552600
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.EB	5315	0	552600
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.ES	87	0	900
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.SES	1	0	900
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.UAS	3	0	900
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.BBE	53150	0	53049600
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.EB	53150	0	53049600

Table C-20 TXP\_MR\_2.5G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.ES	864	0	86400
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.SES	4	0	86400
TXP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.UAS	10	0	86400
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.BBE	10000	0	553500
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.EB	10000	0	553500
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.ES	500	0	900
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.SES	500	0	900
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.UAS	500	0	900
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.BBE	10000	0	53136000
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.EB	100000	0	53136000
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.ES	5000	0	86400
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.SES	5000	0	86400
TXP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.UAS	5000	0	86400

## C.2.21 TXPP\_MR\_10G Card Default Settings

Table C-21 lists the TXPP\_MR\_10G card default settings.

Table C-21 TXPP\_MR\_10G Card Default Settings

Default Name	Default Value	Minimum	Maximum
TXPP-MR-2_5G.config.client.AINSSoakTime	0.333333333333		
TXPP-MR-2_5G.config.client.AlsMode	Disabled		
TXPP-MR-2_5G.config.client.AlsRecoveryPulseDuration	40		
TXPP-MR-2_5G.config.client.AlsRecoveryPulseInterval	100	60	300
TXPP-MR-2_5G.config.client.ppmPortAssignment	UNASSIGNED		
TXPP-MR-2_5G.config.client.ppmSlotAssignment	UNASSIGNED		
TXPP-MR-2_5G.config.client.SDBER	1e-007		
TXPP-MR-2_5G.config.client.SFBER	0.0001		
TXPP-MR-2_5G.config.client.TerminationMode	Transparent		
TXPP-MR-2_5G.config.trunk.AINSSoakTime	0.333333333333		
TXPP-MR-2_5G.config.trunk.AlsMode	Disabled		
TXPP-MR-2_5G.config.trunk.AlsRecoveryPulseDuration	40		
TXPP-MR-2_5G.config.trunk.AlsRecoveryPulseInterval	100	60	300

Table C-21 TXPP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXPP-MR-2_5G.config.trunk.SDBER	1e-007		
TXPP-MR-2_5G.config.trunk.SFBER	0.0001		
TXPP-MR-2_5G.opticalthresholds.client.alarm.HighLaserBias	90		
TXPP-MR-2_5G.opticalthresholds.client.alarm.HighRxPower	3		
TXPP-MR-2_5G.opticalthresholds.client.alarm.HighTxPower	3		
TXPP-MR-2_5G.opticalthresholds.client.alarm.LowRxPower	-21		
TXPP-MR-2_5G.opticalthresholds.client.alarm.LowTxPower	-15		
TXPP-MR-2_5G.opticalthresholds.client.warning.15min.HighLaserBias	81		
TXPP-MR-2_5G.opticalthresholds.client.warning.15min.HighRxPower	2		
TXPP-MR-2_5G.opticalthresholds.client.warning.15min.HighTxPower	2		
TXPP-MR-2_5G.opticalthresholds.client.warning.15min.LowRxPower	-20		
TXPP-MR-2_5G.opticalthresholds.client.warning.15min.LowTxPower	-7		
TXPP-MR-2_5G.opticalthresholds.client.warning.1day.HighLaserBias	85.5		
TXPP-MR-2_5G.opticalthresholds.client.warning.1day.HighRxPower	2.5		
TXPP-MR-2_5G.opticalthresholds.client.warning.1day.HighTxPower	2.5		
TXPP-MR-2_5G.opticalthresholds.client.warning.1day.LowRxPower	-20.5		
TXPP-MR-2_5G.opticalthresholds.client.warning.1day.LowTxPower	-7.5		
TXPP-MR-2_5G.opticalthresholds.trunk.alarm.HighLaserBias	98		
TXPP-MR-2_5G.opticalthresholds.trunk.alarm.HighRxPower	-7		
TXPP-MR-2_5G.opticalthresholds.trunk.alarm.LowRxPower	-25		
TXPP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighLaserBias	95		
TXPP-MR-2_5G.opticalthresholds.trunk.warning.15min.HighRxPower	-7.5		
TXPP-MR-2_5G.opticalthresholds.trunk.warning.15min.LowRxPower	-24.5		
TXPP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighLaserBias	96		
TXPP-MR-2_5G.opticalthresholds.trunk.warning.1day.HighRxPower	-7.3		
TXPP-MR-2_5G.opticalthresholds.trunk.warning.1day.LowRxPower	-24.7		
TXPP-MR-2_5G.otn.fecthresholds.1gethernet.15min.BitErrorsCorrected	112500	0	9033621811 200
TXPP-MR-2_5G.otn.fecthresholds.1gethernet.15min.UncorrectableWords	1	0	4724697600
TXPP-MR-2_5G.otn.fecthresholds.1gethernet.1day.BitErrorsCorrected	10800000	0	8672276938 75200
TXPP-MR-2_5G.otn.fecthresholds.1gethernet.1day.UncorrectableWords	96	0	4535709696 00
TXPP-MR-2_5G.otn.fecthresholds.1gfiberchannel.15min.BitErrorsCorrected	90000	0	9033621811 200
TXPP-MR-2_5G.otn.fecthresholds.1gfiberchannel.15min.UncorrectableWords	1	0	4724697600

Table C-21 TXPP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXPP-MR-2_5G.otn.fecthresholds.1gfiberchannel.1day.BitErrorsCorrected	8640000	0	867227693875200
TXPP-MR-2_5G.otn.fecthresholds.1gfiberchannel.1day.UncorrectableWords	96	0	453570969600
TXPP-MR-2_5G.otn.fecthresholds.1gficon.15min.BitErrorsCorrected	90000	0	9033621811200
TXPP-MR-2_5G.otn.fecthresholds.1gficon.15min.UncorrectableWords	1	0	4724697600
TXPP-MR-2_5G.otn.fecthresholds.1gficon.1day.BitErrorsCorrected	8640000	0	867227693875200
TXPP-MR-2_5G.otn.fecthresholds.1gficon.1day.UncorrectableWords	96	0	453570969600
TXPP-MR-2_5G.otn.fecthresholds.2gfiberchannel.15min.BitErrorsCorrected	180900	0	9033621811200
TXPP-MR-2_5G.otn.fecthresholds.2gfiberchannel.15min.UncorrectableWords	1	0	4724697600
TXPP-MR-2_5G.otn.fecthresholds.2gfiberchannel.1day.BitErrorsCorrected	17366400	0	867227693875200
TXPP-MR-2_5G.otn.fecthresholds.2gfiberchannel.1day.UncorrectableWords	96	0	453570969600
TXPP-MR-2_5G.otn.fecthresholds.2gficon.15min.BitErrorsCorrected	180900	0	9033621811200
TXPP-MR-2_5G.otn.fecthresholds.2gficon.15min.UncorrectableWords	1	0	4724697600
TXPP-MR-2_5G.otn.fecthresholds.2gficon.1day.BitErrorsCorrected	17366400	0	867227693875200
TXPP-MR-2_5G.otn.fecthresholds.2gficon.1day.UncorrectableWords	96	0	453570969600
TXPP-MR-2_5G.otn.fecthresholds.stm1.15min.BitErrorsCorrected	15012	0	9033621811200
TXPP-MR-2_5G.otn.fecthresholds.stm1.15min.UncorrectableWords	1	0	4724697600
TXPP-MR-2_5G.otn.fecthresholds.stm1.1day.BitErrorsCorrected	1441152	0	867227693875200
TXPP-MR-2_5G.otn.fecthresholds.stm1.1day.UncorrectableWords	96	0	453570969600
TXPP-MR-2_5G.otn.fecthresholds.stm16.15min.BitErrorsCorrected	225837	0	9033621811200
TXPP-MR-2_5G.otn.fecthresholds.stm16.15min.UncorrectableWords	1	0	4724697600
TXPP-MR-2_5G.otn.fecthresholds.stm16.1day.BitErrorsCorrected	21680352	0	867227693875200
TXPP-MR-2_5G.otn.fecthresholds.stm16.1day.UncorrectableWords	96	0	453570969600
TXPP-MR-2_5G.otn.fecthresholds.stm4.15min.BitErrorsCorrected	56457	0	9033621811200

Table C-21 TXPP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXPP-MR-2_5G.otn.fecthresholds.stm4.15min.UncorrectableWords	1	0	4724697600
TXPP-MR-2_5G.otn.fecthresholds.stm4.1day.BitErrorsCorrected	5419872	0	8672276938 75200
TXPP-MR-2_5G.otn.fecthresholds.stm4.1day.UncorrectableWords	96	0	4535709696 00
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.15min.BBE	21260	0	8850600
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.15min.ES	87	0	900
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.15min.FC	10	0	72
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.15min.SES	1	0	900
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.15min.UAS	3	0	900
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.1day.BBE	212600	0	849657600
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.1day.ES	864	0	86400
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.1day.FC	40	0	6912
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.1day.SES	4	0	86400
TXPP-MR-2_5G.otn.g709thresholds.pm.farend.1day.UAS	10	0	86400
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.BBE	21260	0	8850600
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.ES	87	0	900
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.FC	10	0	72
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.SES	1	0	900
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.15min.UAS	3	0	900
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.BBE	212600	0	849657600
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.ES	864	0	86400
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.FC	40	0	6912
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.SES	4	0	86400
TXPP-MR-2_5G.otn.g709thresholds.pm.nearend.1day.UAS	10	0	86400
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.15min.BBE	10000	0	8850600
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.15min.ES	500	0	900
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.15min.FC	10	0	72
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.15min.SES	500	0	900
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.15min.UAS	500	0	900
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.1day.BBE	100000	0	849657600
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.1day.ES	5000	0	86400
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.1day.FC	40	0	6912
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.1day.SES	5000	0	86400
TXPP-MR-2_5G.otn.g709thresholds.sm.farend.1day.UAS	5000	0	86400
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.BBE	10000	0	8850600
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.ES	500	0	900

Table C-21 TXPP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.FC	10	0	72
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.SES	500	0	900
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.15min.UAS	500	0	900
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.BBE	100000	0	849657600
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.ES	5000	0	86400
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.FC	40	0	6912
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.SES	5000	0	86400
TXPP-MR-2_5G.otn.g709thresholds.sm.nearend.1day.UAS	5000	0	86400
TXPP-MR-2_5G.otn.otnLines.FEC	Enable		
TXPP-MR-2_5G.otn.otnLines.G709OTN	TRUE		
TXPP-MR-2_5G.otn.otnLines.SDBER	1e-007		
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.BBE	1312	0	137700
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.EB	1312	0	137700
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.ES	87	0	900
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.SES	1	0	900
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.15min.UAS	3	0	900
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.BBE	13120	0	13219200
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.EB	13120	0	13219200
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.ES	864	0	86400
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.SES	4	0	86400
TXPP-MR-2_5G.pmthresholds.stm1.ms.farend.1day.UAS	10	0	86400
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.BBE	1312	0	137700
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.EB	1312	0	137700
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.ES	87	0	900
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.SES	1	0	900
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.15min.UAS	3	0	900
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.BBE	13120	0	13219200
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.EB	13120	0	13219200
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.ES	864	0	86400
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.SES	4	0	86400
TXPP-MR-2_5G.pmthresholds.stm1.ms.nearend.1day.UAS	10	0	86400
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.BBE	10000	0	138600
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.EB	10000	0	138600
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.ES	500	0	900
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.SES	500	0	900
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.15min.UAS	500	0	900



Table C-21 TXPP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.BBE	10000	0	13305600
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.EB	100000	0	13305600
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.ES	5000	0	86400
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.SES	5000	0	86400
TXPP-MR-2_5G.pmthresholds.stm1.rs.nearend.1day.UAS	5000	0	86400
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.BBE	21260	0	2212200
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.EB	21260	0	2212200
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.ES	87	0	900
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.SES	1	0	900
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.15min.UAS	3	0	900
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.BBE	212600	0	212371200
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.EB	212600	0	212371200
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.ES	864	0	900
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.SES	4	0	86400
TXPP-MR-2_5G.pmthresholds.stm16.ms.farend.1day.UAS	10	0	86400
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.BBE	21260	0	2212200
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.EB	21260	0	2212200
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.ES	87	0	900
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.SES	1	0	900
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.15min.UAS	3	0	900
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.BBE	212600	0	212371200
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.EB	212600	0	212371200
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.ES	864	0	86400
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.SES	4	0	86400
TXPP-MR-2_5G.pmthresholds.stm16.ms.nearend.1day.UAS	10	0	86400
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.BBE	10000	0	2151900
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.EB	10000	0	2151900
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.ES	500	0	900
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.SES	500	0	900
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.15min.UAS	500	0	900
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.BBE	10000	0	206582400
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.EB	100000	0	206582400
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.ES	5000	0	86400
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.SES	5000	0	86400
TXPP-MR-2_5G.pmthresholds.stm16.rs.nearend.1day.UAS	5000	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.BBE	5315	0	552600

Table C-21 TXPP\_MR\_10G Card Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.EB	5315	0	552600
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.ES	87	0	900
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.SES	1	0	900
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.15min.UAS	3	0	900
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.BBE	53150	0	53049600
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.EB	53150	0	53049600
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.ES	864	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.SES	4	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.ms.farend.1day.UAS	10	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.BBE	5315	0	552600
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.EB	5315	0	552600
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.ES	87	0	900
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.SES	1	0	900
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.15min.UAS	3	0	900
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.BBE	53150	0	53049600
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.EB	53150	0	53049600
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.ES	864	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.SES	4	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.ms.nearend.1day.UAS	10	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.BBE	10000	0	553500
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.EB	10000	0	553500
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.ES	500	0	900
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.SES	500	0	900
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.15min.UAS	500	0	900
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.BBE	10000	0	53136000
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.EB	100000	0	53136000
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.ES	5000	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.SES	5000	0	86400
TXPP-MR-2_5G.pmthresholds.stm4.rs.nearend.1day.UAS	5000	0	86400

## C.2.22 OSCM Card Default Settings

Table C-22 lists the OSCM card default settings.

**Table C-22** OSCM Card Default Settings

Default Name	Default Value	Minimum	Maximum
OSCM.pmthresholds.ms.farend.15min.BBE	1312	0	137700
OSCM.pmthresholds.ms.farend.15min.EB	1312	0	137700
OSCM.pmthresholds.ms.farend.15min.ES	87	0	900
OSCM.pmthresholds.ms.farend.15min.SES	1	0	900
OSCM.pmthresholds.ms.farend.15min.UAS	3	0	900
OSCM.pmthresholds.ms.farend.1day.BBE	13120	0	13219200
OSCM.pmthresholds.ms.farend.1day.EB	13120	0	13219200
OSCM.pmthresholds.ms.farend.1day.ES	864	0	86400
OSCM.pmthresholds.ms.farend.1day.SES	4	0	86400
OSCM.pmthresholds.ms.farend.1day.UAS	10	0	86400
OSCM.pmthresholds.ms.nearend.15min.BBE	1312	0	137700
OSCM.pmthresholds.ms.nearend.15min.EB	1312	0	137700
OSCM.pmthresholds.ms.nearend.15min.ES	87	0	900
OSCM.pmthresholds.ms.nearend.15min.SES	1	0	900
OSCM.pmthresholds.ms.nearend.15min.UAS	3	0	900
OSCM.pmthresholds.ms.nearend.1day.BBE	13120	0	13219200
OSCM.pmthresholds.ms.nearend.1day.EB	13120	0	13219200
OSCM.pmthresholds.ms.nearend.1day.ES	864	0	86400
OSCM.pmthresholds.ms.nearend.1day.SES	4	0	86400
OSCM.pmthresholds.ms.nearend.1day.UAS	10	0	86400
OSCM.pmthresholds.rs.nearend.15min.BBE	10000	0	138600
OSCM.pmthresholds.rs.nearend.15min.EB	10000	0	138600
OSCM.pmthresholds.rs.nearend.15min.ES	500	0	900
OSCM.pmthresholds.rs.nearend.15min.SES	500	0	900
OSCM.pmthresholds.rs.nearend.1day.BBE	100000	0	13305600
OSCM.pmthresholds.rs.nearend.1day.EB	100000	0	13305600
OSCM.pmthresholds.rs.nearend.1day.ES	5000	0	86400
OSCM.pmthresholds.rs.nearend.1day.SES	5000	0	86400

## C.2.23 OSC-CSM Card Default Settings

Table C-23 lists the OSC\_CSM card default settings.

**Table C-23** OSC-CSM Card Default Settings

Default Name	Default Value	Minimum	Maximum
OSC_CSM.pmthresholds.ms.farend.15min.BBE	1312	0	137700
OSC_CSM.pmthresholds.ms.farend.15min.EB	1312	0	137700
OSC_CSM.pmthresholds.ms.farend.15min.ES	87	0	900
OSC_CSM.pmthresholds.ms.farend.15min.SES	1	0	900
OSC_CSM.pmthresholds.ms.farend.15min.UAS	3	0	900
OSC_CSM.pmthresholds.ms.farend.1day.BBE	13120	0	13219200
OSC_CSM.pmthresholds.ms.farend.1day.EB	13120	0	13219200
OSC_CSM.pmthresholds.ms.farend.1day.ES	864	0	86400
OSC_CSM.pmthresholds.ms.farend.1day.SES	4	0	86400
OSC_CSM.pmthresholds.ms.farend.1day.UAS	10	0	86400
OSC_CSM.pmthresholds.ms.nearend.15min.BBE	1312	0	137700
OSC_CSM.pmthresholds.ms.nearend.15min.EB	1312	0	137700
OSC_CSM.pmthresholds.ms.nearend.15min.ES	87	0	900
OSC_CSM.pmthresholds.ms.nearend.15min.SES	1	0	900
OSC_CSM.pmthresholds.ms.nearend.15min.UAS	3	0	900
OSC_CSM.pmthresholds.ms.nearend.1day.BBE	13120	0	13219200
OSC_CSM.pmthresholds.ms.nearend.1day.EB	13120	0	13219200
OSC_CSM.pmthresholds.ms.nearend.1day.ES	864	0	86400
OSC_CSM.pmthresholds.ms.nearend.1day.SES	4	0	86400
OSC_CSM.pmthresholds.ms.nearend.1day.UAS	10	0	86400
OSC_CSM.pmthresholds.rs.nearend.15min.BBE	10000	0	138600
OSC_CSM.pmthresholds.rs.nearend.15min.EB	10000	0	138600
OSC_CSM.pmthresholds.rs.nearend.15min.ES	500	0	900
OSC_CSM.pmthresholds.rs.nearend.15min.SES	500	0	900
OSC_CSM.pmthresholds.rs.nearend.1day.BBE	100000	0	13305600
OSC_CSM.pmthresholds.rs.nearend.1day.EB	100000	0	13305600
OSC_CSM.pmthresholds.rs.nearend.1day.ES	5000	0	86400
OSC_CSM.pmthresholds.rs.nearend.1day.SES	5000	0	86400

## C.3 Node Default Settings

Table C-24 lists the Cisco ONS 15454 SDH node-level default settings for the Cisco ONS 15454 SDH. Cisco provides the following types of settings preprovisioned for each Cisco ONS 15454 SDH node:

- SNCP settings determine whether SNCP circuits have SD BER and SF BER monitoring enabled, are revertive, and what the reversion time is.
- Craft Access Only allows CTC connectivity to the node only through the craft access port.
- CTC IP Display Suppression prevents display of node IP addresses in CTC.
- Defaults Description lists the current defaults file on the node.
- Enable Firewall enables or disables the use of a firewall for accessing the node.
- Enable Proxy enables or disables the use of a proxy server with the node.
- IIOP Listener Port sets the IIOP listener port number.
- LCD IP Setting sets the node LCD screen to display the node IP address and use the buttons on the LCD panel, only display the IP address, or suppress display of the IP address.
- Login Warning Message warns users at the login screen about the possible legal or contractual ramifications of accessing equipment, systems, or networks without authorization.
- NTP SNTP Server sets the IP address of the NTP SNTP server to be used with the node.
- Time Zone sets the time zone where the node is located.
- Use DST enables or disables the use of Daylight Savings Time.
- Use NTP SNTP Server enables or disables the use of the specified NTP SNTP server with the node.
- LMSP protection settings determine whether or not LMSP-protected circuits have bidirectional switching, are revertive, and what the reversion time is.
- MS-SPRing Protection Settings determine whether MS-SPRing-protected circuits are revertive and what the reversion time is at both the ring and span levels.
- Y Cable Protection Settings determine whether Y-Cable protected circuits have bidirectional switching, are revertive, and what the reversion time is.
- Security Policy settings determine the failed logins before lockout, idle user timeout for each user level, lockout duration, manual unlock user level enabled, password reuse timeout and threshold, and single session per user for the node security.
- BITS Timing settings determine the AIS threshold, coding, and framing for BITS1 and BITS2 timing.
- General Timing settings determine the mode (internal or external), quality of RES, revertive, reversion time, and SSM message set for node timing.

**Table C-24** Node Default Settings

Default Name	Default Value	Minimum	Maximum
NODE.circuits.snep.HO_SDBER	1e-006		
NODE.circuits.snep.HO_SFBER	0.0001		
NODE.circuits.snep.LO_SDBER	1e-005		
NODE.circuits.snep.LO_SFBER	0.001		
NODE.circuits.snep.ReversionTime	5		

Table C-24 Node Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
NODE.circuits.snmp.Revertive	FALSE		
NODE.circuits.State	unlocked, automaticInService		
NODE.general.DefaultsDescription	Factory Defaults		
NODE.general.IIOPListenerPort	57790	0	65535
NODE.general.NtpSntpServer	0.0.0.0		
NODE.general.TimeZone	(GMT-08:00) Pacific Time (US & Canada), Tijuana		
NODE.general.UseDST	TRUE		
NODE.network.general.AlarmMissingBackplaneLAN	FALSE		
NODE.network.general.CtcIpDisplaySuppression	FALSE		
NODE.network.general.GatewaySettings	None		
NODE.network.general.LcdIpSetting	Allow Configuration		
NODE.powerMonitor.EHIBATVG_48V	-56.5		
NODE.powerMonitor.EHIBATVG_60V	-72		
NODE.powerMonitor.ELWBATVG_48V	-40.5		
NODE.powerMonitor.ELWBATVG_60V	-50		
NODE.protection.lmsp.BidirectionalSwitching	FALSE		
NODE.protection.lmsp.ReversionTime	5		
NODE.protection.lmsp.Revertive	FALSE		
NODE.protection.msspr.RingReversionTime	5		
NODE.protection.msspr.RingRevertive	TRUE		
NODE.protection.msspr.SpanReversionTime	5		
NODE.protection.msspr.SpanRevertive	TRUE		
NODE.protection.splitter.ReversionTime	5		
NODE.protection.splitter.Revertive	FALSE		
NODE.protection.ycable.ReversionTime	5		
NODE.protection.ycable.Revertive	FALSE		
NODE.security.access.LANAccess	Front & Backplane		
NODE.security.access.RestoreTimeout	5	0	60
NODE.security.dataComm.CtcBackplaneIpDisplaySuppression	TRUE		
NODE.security.dataComm.DefaultTCCEthernetIP	10.10.0.1		
NODE.security.dataComm.DefaultTCCEthernetIPNetmask	24		
NODE.security.dataComm.LcdBackplaneIpSetting	Display Only		
NODE.security.dataComm.SecureModeLocked	FALSE		
NODE.security.dataComm.SecureModeOn	FALSE		
NODE.security.idleUserTimeout.Maintenance	0.041666666667		

Table C-24 Node Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
NODE.security.idleUserTimeout.Provisioning	0.020833333333		
NODE.security.idleUserTimeout.Retrieve	0		
NODE.security.idleUserTimeout.Superuser	0.010416666667		
NODE.security.legalDisclaimer.LoginWarningMessage	<center><b>WARNING</b></center>This system is restricted to authorized users for business purposes. Unauthorized access is a violation of the law. This service may be monitored for administrative and security reasons. By proceeding, you consent to this monitoring.		
NODE.security.other.DisableInactiveUser	FALSE		
NODE.security.other.InactiveDuration	45	20	90
NODE.security.other.PMClearingPrivilege	Provisioning		
NODE.security.other.SingleSessionPerUser	FALSE		
NODE.security.passwordAging.EnforcePasswordAging	FALSE		
NODE.security.passwordAging.maintenance.AgingPeriod	45	20	90
NODE.security.passwordAging.maintenance.WarningPeriod	5	2	20
NODE.security.passwordAging.provisioning.AgingPeriod	45	20	90
NODE.security.passwordAging.provisioning.WarningPeriod	5	2	20
NODE.security.passwordAging.retrieve.AgingPeriod	45	20	90
NODE.security.passwordAging.retrieve.WarningPeriod	5	2	20
NODE.security.passwordAging.superuser.AgingPeriod	45	20	90
NODE.security.passwordAging.superuser.WarningPeriod	5	2	20
NODE.security.passwordChange.CannotChangeNewPassword	FALSE		
NODE.security.passwordChange.CannotChangeNewPasswordForNDays	20	20	95
NODE.security.passwordChange.PreventReusingLastNPasswords	1	1	10
NODE.security.passwordChange.RequirePasswordChangeOnFirstLoginToNewAccount	FALSE		
NODE.security.shellAccess.EnableShellPassword	FALSE		
NODE.security.shellAccess.SSH	FALSE		
NODE.security.shellAccess.TelnetPort	23	23	9999
NODE.security.userLockout.FailedLoginsBeforeLockout	5	0	10
NODE.security.userLockout.LockoutDuration	0.020833333333	0	600
NODE.security.userLockout.ManualUnlockBySuperuser	FALSE		

Table C-24 Node Default Settings (continued)

Default Name	Default Value	Minimum	Maximum
NODE.timing.bits-1.AdminSSMIn	STU		
NODE.timing.bits-1.AISThreshold	G812L		
NODE.timing.bits-1.Coding	HDB3		
NODE.timing.bits-1.CodingOut	HDB3		
NODE.timing.bits-1.FacilityType	E1		
NODE.timing.bits-1.FacilityTypeOut	E1		
NODE.timing.bits-1.Framing	FAS+CAS+CRC		
NODE.timing.bits-1.FramingOut	FAS+CAS+CRC		
NODE.timing.bits-1.Sa bit	4		
NODE.timing.bits-1.State	unlocked		
NODE.timing.bits-1.StateOut	unlocked		
NODE.timing.bits-2.AdminSSMIn	STU		
NODE.timing.bits-2.AISThreshold	G812L		
NODE.timing.bits-2.Coding	HDB3		
NODE.timing.bits-2.CodingOut	HDB3		
NODE.timing.bits-2.FacilityType	E1		
NODE.timing.bits-2.FacilityTypeOut	E1		
NODE.timing.bits-2.Framing	FAS+CAS+CRC		
NODE.timing.bits-2.FramingOut	FAS+CAS+CRC		
NODE.timing.bits-2.Sa bit	4		
NODE.timing.bits-2.State	unlocked		
NODE.timing.bits-2.StateOut	unlocked		
NODE.timing.general.Mode	External		

## C.4 CTC Default Settings

Table C-25 lists the CTC-level default settings for the Cisco ONS 15454 SDH. Cisco provides the following types of settings preprovisioned for CTC.

- Create circuits with the Auto route check box selected by default
- Create TL1-like circuits—instructs the node to create only cross-connects, allowing the resulting circuits to be in an upgradable state.
- Choose a default network map (which country)



**Table C-25**      **CTC Default Settings**

<b>Default Name</b>	<b>Default Value</b>
CTC.circuits.AutoRoute	TRUE
CTC.circuits.CreateLikeTL1	FALSE
CTC.network.Map	United States





## INDEX

---

## Numerics

### 1+1 optical card protection

creating linear ADMs [11-28](#)

description [7-4](#)

### 1:1 electrical card protection [7-1](#)

### 1:N electrical card protection [7-2](#)

802.3ad link aggregation. *See* IEEE 802.3ad link aggregation

802.3z flow control. *See* IEEE 802.3z flow control

---

## A

access control list. *See* ACLs

ACLs, example [12-26](#)

add-drop multiplexer. *See* linear ADM

ADM. *See* linear ADM

administrative states [B-2](#)

Advanced Timing Communications and Control Card. *See* TCC2

Advanced Timing Communications and Control Card Plus. *See* TCC2P

### AIC-I card

block diagram [2-17](#)

cross-connect compatibility [2-3](#)

description [2-16](#)

external alarms [2-18](#)

external controls [2-18](#)

faceplate [2-17](#)

input/output (external) alarm contacts [2-18](#)

LEDs [2-17](#)

orderwire [2-19](#)

power monitoring [2-20](#)

software compatibility [2-3](#)

specifications [A-10](#)

temperature range [A-6](#)

user data channel [2-20](#)

### air filter

description [1-14](#)

requirement [1-13](#)

### alarm profiles

description [13-10](#)

applying [13-13](#)

comparing [13-12](#)

creating [13-11](#)

deleting [13-12](#)

editing [13-12](#)

listing all [13-12](#)

listing by node [13-12](#)

loading [13-12](#)

modifying [13-11](#)

row display options [13-13](#)

saving [13-12](#)

severity options [13-12](#)

### alarms

autodelete [13-5](#)

change default severities. *See* alarm profiles

controlling display [13-5](#)

counts, viewing [13-2](#)

create profiles. *See* alarm profiles

deleting cleared [13-5](#)

displaying history [13-10](#)

filtering [13-5](#)

history [13-8](#)

monitoring and managing [13-1 to 13-17](#)

numbering scheme (port-based) [13-4](#)

pin connections [1-14](#)

- retrieving history [13-10](#)
- RMON alarm thresholds [14-23](#)
- severities [13-9, 13-10](#)
- suppressing [13-14](#)
- synchronizing [13-5](#)
- table columns [13-3](#)
- user-defined [2-18](#)
- viewing [13-3](#)
- viewing by time zone [13-5](#)

audit trail [9-6, 13-16](#)

automatic circuit routing [10-16](#)

automaticInService secondary service state [B-1](#)

---

## B

bandwidth

- allocation and routing [10-17](#)
- cross-connect card [10-9](#)
- four-fiber MS-SPRing capacity [11-9](#)
- two-fiber MS-SPRing capacity [11-8](#)

BITS

- external node timing source [9-7](#)
- interface specifications [A-2](#)

BLANK card

- description [3-14](#)
- faceplate [3-15](#)

broadcast domains [14-13](#)

---

## C

C2 byte [10-15](#)

cables

- CAT-5 (LAN) [1-11](#)
- coaxial [1-8, 1-10](#)
- DS-1 [1-10](#)
- routing [1-11](#)

card compatibility [2-2](#)

card protection

- 1:0 electrical. *See* card protection, unprotected electrical, description [7-1](#)
- Ethernet (spanning tree) [14-17](#)
- optical [7-4](#)
- unprotected [7-4](#)

cards

*See also* individual cards indexed by name

- colors onscreen [8-7](#)
- Ethernet [5-2](#)
- installing [1-15](#)
- number of ports per [1-16](#)
- optical (summary) [4-2 to 4-3](#)
- physical description [1-15](#)
- replacement [1-18](#)
- replacing [11-12](#)
- slot requirements [1-15](#)

card view, list of tabs [8-14](#)

circuits

- definition [14-20, 14-23](#)
- attributes [10-1](#)
- automatic routing [10-16](#)
- constraint-based routing [10-22](#)
- creating manual [10-12](#)
- editing [10-7](#)
- Ethernet [10-20](#)
- Ethernet manual cross-connect [14-19](#)
- find circuits with alarms [13-6](#)
- G1000-4 restrictions [14-19](#)
- hub-and-spoke Ethernet circuit [14-22](#)
- in network view (figure) [10-4](#)
- manual Ethernet cross-connects [14-19, 14-23](#)
- manual routing detail [10-18](#)
- merge [10-24](#)
- monitor [10-12](#)
- point-to-point Ethernet circuit [14-19, 14-21](#)
- properties [10-2 to 10-4](#)
- protection types [10-7](#)
- reconfigure [10-25](#)
- secondary circuit source for [10-2](#)

- shared packet ring [10-21](#)
- shared packet ring Ethernet circuit [14-22](#)
- status [10-4](#)
- types of [10-1](#)
- unidirectional [10-21](#)
- unidirectional with multiple drops [10-12](#)
- user-defined names for [10-1](#)
- VCAT [10-22](#)
- circuit states [10-5](#)
- Cisco Transport Controller. *See* CTC
- CMS. *See* CTC
- coaxial. *See* cables
- colors
  - alarm and condition severities [13-4](#)
  - and symbols on slots and cards [1-16](#)
  - cards [8-7, 8-8](#)
  - nodes [8-12](#)
  - on FMEC slots [1-8](#)
  - port states [10-8](#)
- common control cards. *See* individual card names
- common fiber routing [10-23](#)
- computer
  - connecting to ONS 15454 SDH using a craft connection [8-6](#)
  - requirements [8-3](#)
  - software installed on [8-3](#)
- conditions
  - column descriptions [13-8](#)
  - controlling display of [13-7](#)
  - displaying [13-7](#)
  - displaying history [13-10](#)
  - filtering [13-7, 13-8](#)
  - retrieving [13-7](#)
  - retrieving history [13-10](#)
  - tab [13-7](#)
- connected rings [11-26](#)
- connecting the ONS 15454 SDH [8-5](#)
- connectors
  - locations on card [1-16](#)

- types on cards [1-16](#)
- corporate LAN [8-6](#)
- cost [12-8](#)
- craft connection [8-6](#)
- cross-connect
  - E-Series Ethernet [14-23](#)
  - See* circuits
  - See* XC10G card
  - See* XC-VXL-10G card
  - See* XC-VXL-2.5G card
- CTC
  - alarms
    - See also* alarms
    - history [13-8](#)
    - profiles [13-10](#)
    - viewing [13-3](#)
  - compatibility [1-18 to 1-21](#)
  - computer requirements [8-3](#)
  - export data [13-1](#)
  - print data [13-1](#)
  - reverting to earlier load [8-15](#)
  - timing setup [9-7](#)
  - views
    - description [8-6](#)
    - card view [8-13](#)
    - network. *See* network view
    - node. *See* node view
- C-Temp ranges [A-6](#)

---

## D

- database
  - about [8-15](#)
  - revert [8-15](#)
  - storage specifications [A-2](#)
  - version [8-1](#)
- data communications channel. *See* DCC
- datagrams [12-4](#)
- DCC

- defined [10-10](#)
- definition [10-10](#)
- load balancing [10-10](#)
- SDH [10-10](#)
- tunneling [10-10](#)
- viewing connections [8-12](#)

DCC/GCC [2-7](#)

DCS [11-27](#)

destination

- host [12-4](#)
- routing table [12-23](#)
- secondary sources and destinations [10-17](#)

DHCP [12-3](#)

digital cross connect systems. *See* DCS

disabled secondary service state [B-1](#)

documentation

- conventions [1-xxxi](#)
- objectives [1-xxx](#)
- organization [1-xxx to 1-xxxi](#)
- related to this book [1-xxxi](#)

DRI

- description [11-18, 11-22](#)
- integrated (figure) [11-24](#)
- traditional (figure) [11-23](#)

drop

- creating multiple [10-12](#)
- definition [14-20, 14-23](#)
- drop port [10-15](#)
- drop ports, service state requirements [10-6](#)
- secondary sources and destinations [10-17](#)

DS3i-N-12 card

- block diagram [3-11](#)
- cross-connect compatibility [2-3](#)
- description [3-10](#)
- EIA requirement [1-2](#)
- faceplate [3-11](#)
- LEDs [3-12](#)
- path trace [10-15](#)
- port status [3-12](#)

- software compatibility [3-4](#)
- specifications [A-15](#)
- temperature range [A-6](#)

dual GNEs [12-17](#)

dual-ring interconnect. *See* DRI

---

## E

E1000-2-G card

- block diagram [5-5](#)
- compatible GBICs [5-15](#)
- cross-connect compatibility [2-4](#)
- description [5-4](#)
- faceplate [5-5](#)
- LEDs [5-6](#)
- port status [5-6](#)
- software compatibility [5-2](#)
- specifications [A-40](#)

E100T-G card

- block diagram [5-3](#)
- cross-connect compatibility [2-4](#)
- description [5-2](#)
- faceplate [5-3](#)
- LEDs [5-4](#)
- port status [5-4](#)
- software compatibility [5-2](#)
- specifications [A-39](#)

E1-42 card

- description [3-6](#)
- block diagram [3-7](#)
- cross-connect compatibility [2-3](#)
- faceplate [3-7](#)
- LEDs [3-8](#)
- port status [3-8](#)
- software compatibility [3-4](#)
- specifications [A-13](#)
- temperature range [A-6](#)

E1-75/120 impedance conversion panel

- block diagram [3-27](#)

- description [3-26](#)
  - faceplate [3-26](#)
  - functionality [3-28](#)
  - mounting [3-27](#)
  - mounting in a rack [1-10](#)
  - physical description [1-9](#)
  - specifications [A-21](#)
  - temperature range [A-7](#)
- E1-N-14 card
- block diagram [3-5](#)
  - cross-connect compatibility [2-3](#)
  - description [3-4](#)
  - faceplate [3-5](#)
  - LEDs [3-6](#)
  - port status [3-6](#)
  - software compatibility [3-4](#)
  - specifications [A-12](#)
- E3-12 card
- description [3-8](#)
  - block diagram [3-9](#)
  - cross-connect compatibility [2-3](#)
  - faceplate [3-9](#)
  - LEDs [3-10](#)
  - path trace [10-15](#)
  - port status [3-10](#)
  - software compatibility [3-4](#)
  - specifications [A-14](#)
  - temperature range [A-6](#)
- east port [11-12](#)
- editing circuits [10-7](#)
- electrical cards
- See also* individual card names
  - overview [3-2 to 3-3](#)
  - power requirements [A-5](#)
  - temperature range [A-6](#)
- electrical codes [1-2](#)
- electrical interface assemblies. *See* EIA
- end network element. *See* proxy server
- ENE. *See* proxy server
- enterprise LAN. *See* corporate LAN
- environmental alarms [13-15](#)
- E-Series
- Ethernet cards [14-10](#)
- E-Series Ethernet cards
- See also* individual card names
  - power requirements [A-6, A-7](#)
- Ethernet
- See also* cards indexed by name
  - and SNCP [10-20](#)
  - applications [14-1 to 14-26](#)
  - cards [5-1 to A-42](#)
  - circuits [10-20](#)
    - hub-and-spoke [14-22](#)
    - manual cross-connects [14-19, 14-23](#)
    - multicard and single-card EtherSwitch point-to-point [14-19, 14-21](#)
    - shared packed ring circuit [14-22](#)
  - collision monitoring (RMON) [14-23](#)
  - EtherSwitch [14-10 to 14-21](#)
  - flow control on E-Series [14-12](#)
  - flow control on G-Series [14-3](#)
  - frame buffering [14-3](#)
  - Gigabit EtherChannel [14-4](#)
  - Jumbo frames [14-1](#)
  - link integrity [14-4](#)
  - priority queuing [14-15](#)
  - router aggregation [5-1, 14-1](#)
  - shared packet ring routing [10-19](#)
  - spanning tree protection [14-16](#)
  - threshold variables (MIBs) [14-24](#)
  - transponder mode for G-Series [14-5](#)
  - VLAN counter [14-13](#)
  - VLANs [14-13](#)
- EtherSwitch
- multicard [14-10](#)
  - single-card [14-11](#)
- examples
- DCC tunnel [10-10](#)

- extended SNCP [11-29](#)
  - MS-SPRing bandwidth reuse [11-9](#)
  - MS-SPRing subtending MS-SPRing [11-28](#)
  - network timing [9-7](#)
  - optical card protection [7-4](#)
  - two-fiber MS-SPRing [11-10](#)
  - extended SNCP [11-29](#)
  - external alarms
    - description [2-18](#)
    - input [13-15](#)
    - provisioning [13-15](#)
  - external controls
    - description [2-18, 13-15](#)
    - output [13-15](#)
  - external switching commands [7-5](#)
  - external timing [9-7](#)
- 
- F**
- fan-tray air filter. *See* air filter
  - fan-tray assembly
    - description [1-13](#)
    - fan failure [1-14](#)
    - fan speed [1-14](#)
  - FC\_MR-4 card
    - application [6-5](#)
    - block diagram [6-2](#)
    - compatible GBICs and SFPs [5-15](#)
    - cross-connect compatibility [6-3](#)
    - description [6-1](#)
    - faceplate [6-2](#)
    - LEDs [6-2](#)
    - modes [6-3 to 6-5](#)
    - power requirement [A-6](#)
    - specifications [A-42](#)
    - temperature range [A-7](#)
    - VCAT members [10-24](#)
  - fiber management [1-12](#)
  - filtering, rules for proxy server firewalls [12-16, 12-17](#)
  - firewalls
    - external [12-25](#)
    - proxy server filtering rules [12-16, 12-17](#)
  - firewall tunnels
    - and proxy server in GNE or ENE mode [12-27](#)
    - for foreign terminations [12-28](#)
    - setting up [12-27](#)
  - flow control [14-3, 14-12](#)
  - FMEC
    - connectors [1-8](#)
    - description [1-7](#)
    - line rates [1-8](#)
    - ports [1-8](#)
    - power requirements [A-5](#)
    - symbol definitions [1-8](#)
  - FMEC-BLANK card
    - description [3-29](#)
    - faceplate [3-30](#)
  - FMEC-DS1/E1 card
    - block diagram [3-16](#)
    - connector pinout [3-17](#)
    - description [3-16](#)
    - faceplate [3-16](#)
    - specifications [A-18](#)
    - temperature range [A-6](#)
  - FMEC E1-120NP card
    - block diagram [3-19](#)
    - connector pinout [3-19](#)
    - description [3-18](#)
    - faceplate [3-19](#)
    - specifications [A-18](#)
    - temperature range [A-6](#)
  - FMEC E1-120PROA card
    - block diagram [3-21](#)
    - connector pinout [3-21](#)
    - description [3-21](#)
    - faceplate [3-21](#)
    - specifications [A-19](#)
    - temperature range [A-7](#)



## FMEC E1-120PROB card

- block diagram [3-24](#)
- connector pinout [3-24](#)
- description [3-23](#)
- faceplate [3-24](#)
- specifications [A-20](#)
- temperature range [A-7](#)

## FMEC-E1 card

- block diagram [3-16](#)
- description [3-15](#)
- faceplate [3-16](#)
- specifications [A-17](#)
- temperature range [A-6](#)

## FMEC-E3/DS3 card

- block diagram [3-28](#)
- description [3-28](#)
- faceplate [3-28](#)
- temperature range [A-7](#)

## FMEC STM1E 1:1 card

- block diagram [3-29](#)
- description [3-29](#)
- faceplate [3-29](#)
- specifications [A-23](#)

foreign node connection (figure) [12-29](#)four-fiber MS-SPRing. *See* MS-SPRingframe buffering [14-3](#)

## front door

- equipment access [1-3](#)
- label [1-6](#)
- removing [1-5](#)

front mount electrical connection. *See* FMECfuse and alarm panel [1-1](#)


---

**G**

## G1000-4 card

- block diagram [5-7](#)
- circuit restrictions [14-19](#)
- circuits [14-19](#)

compatibility [5-8](#)compatible GBICs [5-15](#)cross-connect compatibility [2-4](#)description [5-7](#)faceplate [5-7](#)GBIC [5-7](#)LEDs [5-8](#)port status [5-8](#)software compatibility [5-2](#)specifications [A-40](#)

## G1K-4 card

block diagram [5-9](#)compatible GBICs [5-15](#)cross-connect compatibility [2-4](#)description [5-8](#)faceplate [5-9](#)LEDs [5-10](#)port status [5-10](#)software compatibility [5-2](#)specifications [A-41](#)

## gateway

default [12-3](#), [12-6](#)on routing table [12-23](#)Proxy ARP-enabled [12-4](#)returning MAC address [12-4](#)to non-LAN-connected nodes [12-1](#)gateway network element. *See* proxy server

## GBIC

compatible cards [5-15](#)

## CWDM and DWDM

description [5-16](#)example [5-18](#)placement [5-17](#)supported wavelengths [5-17](#)description [5-15](#)figure [5-16](#)G1000-4 card [5-7](#)used with Ethernet cards [5-14](#)generic communication channel. *See* DCC/GCC

GNE. *See* proxy server

GNE load balancing [12-17](#)

go-and-return SNCP routing [10-13](#)

grounding [1-14](#)

G-Series

default SDH mode (diagram) [14-6](#)

in transponder mode (diagram) [14-7](#)

transponder mode characteristics [14-9](#)

G-Series Ethernet cards

*See also* individual card names

power requirements [A-6, A-7](#)

---

## H

hold-off timer [11-18](#)

hop [12-8](#)

hub-and-spoke [14-22](#)

---

## I

idle user timeout [9-5](#)

IEEE 802.1Q (priority queuing) [14-15](#)

IEEE 802.3ad link aggregation [14-4](#)

IEEE 802.3z flow control

E-Series [14-12](#)

G-Series [14-3](#)

installation

coaxial cables [1-8, 1-10](#)

overview [1-1](#)

power supply [1-14](#)

Internet protocol. *See* IP

interoperability

JRE compatibility [8-4](#)

software and hardware matrix [1-18 to 1-21](#)

IP

environments [12-1](#)

networking [12-1 to 12-25](#)

requirements [12-2](#)

subnetting [12-1](#)

IP addressing scenarios

CTC and nodes connected to router [12-3](#)

CTC and nodes on same subnet [12-2](#)

default gateway on CTC workstation [12-6](#)

dual GNEs on a subnet [12-17](#)

OSPF [12-9](#)

Proxy ARP and gateway [12-4](#)

proxy server [12-11 to 12-17](#)

secure mode enabled [12-19](#)

static routes connecting to LANs [12-7](#)

IP encapsulated tunnel [10-11](#)

IPX [14-2](#)

I-Temp ranges [A-6](#)

---

## J

J1/J2 bytes [10-15](#)

J1/J2 path trace [10-15](#)

Java and CTC, overview [8-1](#)

JRE

CTC requirements [8-3](#)

version requirements [8-5](#)

---

## K

K byte [11-3](#)

---

## L

LAN pin connections [1-14](#)

laser warning [1-6, 1-7](#)

Layer 2 switching [14-10](#)

LCD

description [1-13](#)

viewing alarm counts on [13-3](#)

linear ADM configuration [11-28](#)

linear mapper E-Series [14-11](#)

line timing [9-7](#)  
link aggregation [14-4](#)  
link integrity [14-4](#)  
load balancing [10-10](#)  
local craft pin connections [1-14](#)  
Locked,disabled administrative state [B-2](#)  
Locked,maintenance administrative state [B-2](#)  
Locked,outOfGroup administrative state [B-2](#)  
Locked-disabled service state [B-1](#)  
Locked-enabled service state [B-1](#)  
login node groups [8-11](#)  
loopbacks, card view indicator [8-9](#)  
loopback secondary service state [B-2](#)

## M

MAC address  
clear table [9-3](#)  
proxy ARP [12-4](#)  
retrieve table [9-3](#)  
maintenance secondary service state [B-2](#)  
managing fibers [1-12](#)  
merge circuits [10-24](#)  
MIB  
Ethernet [14-24](#)  
MIC-A/P card  
block diagram [3-30](#)  
connector pinouts [3-31](#)  
description [3-30](#)  
faceplate [3-30](#)  
specifications [A-24](#)  
MIC-C/T/P card  
block diagram [3-33](#)  
description [3-33](#)  
faceplate [3-33](#)  
port status [3-34](#)  
specifications [A-25](#)  
Microsoft Internet Explorer [8-3](#)  
mismatchOfEquipment secondary service state [B-2](#)

ML1000-2 card  
compatible SFPs [5-15](#)  
cross-connect compatibility [2-4](#)  
description [5-12](#)  
faceplate [5-13](#)  
LEDs [5-13](#)  
port status [5-14](#)  
slot compatibility [5-14](#)  
software compatibility [5-2](#)  
specifications [A-42](#)  
ML100T-12 card  
cross-connect compatibility [2-4](#)  
description [5-10](#)  
faceplate [5-11](#)  
LEDs [5-11](#)  
port status [5-12](#)  
slot compatibility [5-12](#)  
software compatibility [5-2](#)  
specifications [A-41](#)  
ML-Series Ethernet cards  
*See also* individual card names  
power requirements [A-6, A-7](#)  
VCAT members [10-24](#)  
monitor circuits [10-12](#)  
MS-SPRing  
bandwidth capacity [11-8](#)  
connecting with SNCP [11-25](#)  
DRI [11-18](#)  
DRI with opposite-side routing (figure) [11-20](#)  
DRI with same-side routing (figure) [11-19](#)  
fiber configuration example [11-12](#)  
fiber connections [11-12](#)  
five-node, two-fiber [11-10](#)  
four-fiber [11-6](#)  
four-node, two-fiber (figure) [11-4](#)  
four-node, two-fiber after line break (figure) [11-5](#)  
increasing the traffic speed [11-31](#)  
integrated DRI (figure) [11-21](#)  
maximum node number [11-2](#)

- ring switching [11-8](#)
- span switching [11-7](#)
- subtending from an MS-SPRing [11-28](#)
- two-fiber description [11-2](#)
- two-fiber ring example [11-10](#)

multicard EtherSwitch [14-10](#)

multicast [14-1](#)

multiple drops [10-12](#)

multiplex section-shared protection ring. *See* MS-SPRing

---

## N

Netscape [8-3](#)

network element defaults

- node settings [C-68](#)

networks

- building circuits [10-1](#)
- IP networking [12-1 to 12-25](#)
- SDH topologies [11-1 to 11-30](#)
- timing example [9-7](#)

network view

- description [8-11](#)
- CTC software versions (figure) [8-2](#)
- login node groups [8-11](#)
- node status (icon colors) [8-12](#)

node view

- description [8-7](#)
- card colors [8-7](#)
- creating users [9-1](#)
- CTC software versions (figure) [8-2](#)
- tabs list [8-10, 8-12](#)
- viewing popup information [8-10](#)

notInstalled secondary service state [B-2](#)

---

## O

OAM&P access [8-6](#)

OC12 IR/STM4 SH 1310-4 card

- block diagram [4-19](#)
- description [4-17](#)
- faceplate [4-18](#)
- LEDs [4-20](#)
- port status [4-20](#)
- software compatibility [4-4](#)
- specifications [A-30](#)

OC12 IR/STM4 SH 1310 card

- block diagram [4-11](#)
- description [4-11](#)
- faceplate [4-11](#)
- LEDs [4-12](#)
- port status [4-12](#)
- software compatibility [4-3](#)
- specifications [A-28](#)

OC12 LR/STM4 LH 1310 card

- block diagram [4-14](#)
- description [4-12](#)
- faceplate [4-13](#)
- LEDs [4-14](#)
- port status [4-15](#)
- software compatibility [4-3](#)
- specifications [A-29](#)

OC12 LR/STM4 LH 1550 card

- block diagram (figure) [4-16](#)
- description [4-15](#)
- faceplate (figure) [4-16](#)
- LEDs [4-17](#)
- port status [4-17](#)
- software compatibility [4-3](#)
- specifications [A-29](#)

OC192 IR/STM64 SH 1550 card

- block diagram [4-34](#)
- description [4-32](#)
- faceplate [4-33](#)
- functionality [4-34](#)
- LEDs [4-35](#)
- port status [4-35](#)
- software compatibility [4-4](#)

- specifications [A-35](#)
- OC192 LR/STM64 LH 1550 card
  - block diagram [4-36](#)
  - description [4-35](#)
  - faceplate [4-36, 4-37](#)
  - functionality [4-37](#)
  - LEDs [4-38](#)
  - port status [4-38](#)
  - software compatibility [4-4](#)
  - specifications [A-36](#)
- OC192 LR/STM64 LH ITU 15xx.xx card
  - block diagram [4-40](#)
  - description [4-39](#)
  - faceplate [4-39](#)
  - functionality [4-40](#)
  - LEDs [4-41](#)
  - port status [4-41](#)
  - software compatibility [4-4](#)
  - specifications [A-38](#)
- OC192 SR/STM64 IO 1310 card
  - block diagram [4-31](#)
  - description [4-29](#)
  - faceplate [4-30](#)
  - functionality [4-31](#)
  - LEDs [4-31](#)
  - port status [4-32](#)
  - software compatibility [4-4](#)
  - specifications [A-34](#)
- OC3IR/STM1SH 1310-8 card
  - block diagram [4-9](#)
  - description [4-7](#)
  - faceplate [4-8](#)
  - LEDs [4-10](#)
  - port status [4-10](#)
  - software compatibility [4-3](#)
  - specifications [A-27](#)
- OC3 IR 4/STM1 SH 1310 card
  - block diagram [4-6](#)
  - description [4-4](#)
- faceplate [4-5](#)
- LEDs [4-7](#)
- port status [4-7](#)
- software compatibility [4-3](#)
- specifications [A-26](#)
- OC48 ELR/STM16 EH 100 GHz cards
  - block diagram [4-28](#)
  - description [4-26](#)
  - faceplate [4-27](#)
  - LEDs [4-29](#)
  - port status [4-29](#)
  - software compatibility [4-4](#)
  - specifications [A-33](#)
- OC48 IR/STM16 SH AS 1310 card
  - block diagram [4-22](#)
  - description [4-20](#)
  - faceplate [4-21](#)
  - LEDs [4-22](#)
  - port status [4-23](#)
  - software compatibility [4-4](#)
  - specifications [A-31](#)
- OC48 LR/STM16 LH AS 1550 card
  - block diagram [4-25](#)
  - description [4-23](#)
  - faceplate [4-24](#)
  - LEDs [4-25](#)
  - port status [4-26](#)
  - software compatibility [4-4](#)
  - specifications [A-32](#)
- open GNE [12-27](#)
- Open Shortest Path First. *See* OSPF
- optical protection. *See* card protection
- orderwire
  - description [2-19](#)
  - express [2-19](#)
  - local [2-19](#)
  - loop [2-20](#)
  - pin assignments [2-20](#)
- OSPF

alternative to static routes [12-7](#)  
 definition [12-9 to 12-11](#)  
 enabled (figure) [12-10](#)  
 not enabled (figure) [12-11](#)  
 outOfGroup secondary service state [B-2](#)

---

## P

partial service state [10-6](#)  
 path signal label [10-15](#)  
 path trace [10-15](#)  
 PC. *See* computer  
 PCM [2-19](#)  
 ping [12-2](#)  
 point-to-point. *See* Ethernet circuits  
 popup data [8-10](#)  
 port-mapped E-Series [14-11](#)  
 ports
 

- card list [1-16](#)
- drop [10-15](#)
- line rate by card [1-16](#)
- status [8-13](#)

 power monitoring [2-20](#)  
 power supply [1-14](#)  
 priority queuing [14-15](#)  
 protection, for circuits [10-7](#)  
 protection switching
 

- MS-SPRing span switching [11-7](#)
- nonrevertive [7-4](#)
- ring switching [11-8](#)

 protocols
 

- IP [12-1](#)
- Proxy ARP. *See* Proxy ARP
- spanning tree. *See* Spanning Tree Protocol
- SSM [9-8](#)

 provisionable patchcords
 

- client/client card combinations [12-22](#)
- client/trunk card combinations [12-22](#)
- description [12-21](#)

- trunk/trunk card combinations [12-23](#)
- provisioning, documenting [13-1](#)
- Proxy ARP
  - description [12-1](#)
  - enable an ONS 15454 SDH gateway [12-4](#)
  - use with static routes [12-5](#)
- proxy server
  - firewall filtering rules [12-16, 12-17](#)
  - gateway settings [12-13](#)
  - GNE and ENE settings [12-14](#)
  - GNE and ENes on different subnets (figure) [12-15](#)
  - GNE and ENes on the same subnet (figure) [12-14](#)
  - provisioning [12-11 to 12-17](#)
  - with ENes on multiple rings (figure) [12-16](#)
- proxy tunnels
  - and proxy server in GNE or ENE mode [12-27](#)
  - for foreign terminations [12-28](#)
  - setting up [12-27](#)
- PST [B-1](#)
- PSTQ [B-1](#)

---

## Q

Q-tagging [14-13](#)  
 queuing [14-15](#)

---

## R

rack size [1-2](#)  
 reconfigure circuits [10-25](#)  
 revert [8-15](#)  
 rings
 

- maximum per node [11-1](#)
- subtended [11-26](#)
- virtual [11-30](#)

 RJ-11 connector [2-20](#)  
 RJ-11 port [2-19, 2-20](#)  
 RJ-45 port [1-17, 2-21](#)

RJ-45 port. *See* TCC2 card or TCC2P card

## RMON

Ethernet alarm thresholds [14-23](#)

routing table [12-23](#)

## S

safety information [1-xxxii to ??](#)

SAN card. *See* FC\_MR-4 card

## SDH

K1, K2, and K3 bytes [11-3](#)

topologies [11-1](#)

secondary sources [10-17](#)

secure mode, IP addressing [12-19](#)

secure shell [9-6](#)

## security

idle user timeout [9-5](#)

requirements [9-1](#)

tasks per level [9-2, 9-4](#)

viewing [8-7](#)

## service states

card state transitions [B-3](#)

overview [B-1](#)

ports [8-8](#)

## SFP

description [5-18](#)

figure [5-18, 5-19](#)

specifications [A-3](#)

used with Ethernet cards [5-14](#)

shared packet ring [10-19, 10-21, 14-22](#)

## shelf

bandwidth specifications [A-1](#)

dimensions [A-3](#)

environmental specifications [A-3](#)

power specifications [A-3](#)

specifications [C-1](#)

## shelf assembly

dimensions [1-3](#)

four-node configuration [11-31](#)

shortest path [11-2](#)

single-card EtherSwitch [14-11](#)

## slots

card requirements [1-15](#)

FMEC symbols on [1-8](#)

physical description [1-15](#)

## SNCP

and Ethernet [10-20](#)

basic four-node ring (figure) [11-14](#)

circuit editing [10-12](#)

connecting with MS-SPRing [11-25](#)

description [11-13](#)

DRI [11-22](#)

go-and-return routing [10-13](#)

increasing the traffic speed [11-31](#)

ring with fiber break (figure) [11-15](#)

STM-1 ring (figure) [11-16](#)

switch protection paths [10-12](#)

virtual [10-18](#)

with protected links [10-19](#)

soak time [10-6](#)

## software

*See also* CTC

card compatibility [2-2](#)

installation [8-1](#)

revert [8-15](#)

softwareDownload secondary service state [B-2](#)

source [14-20, 14-23](#)

## Spanning Tree Protocol

configuration [14-18](#)

description [14-16](#)

Gigabit EtherChannel [14-5](#)

multi-instance [14-17](#)

parameters [14-18](#)

## span upgrades

manual [11-32](#)

wizard [11-32](#)

SSH [9-6](#)

SSM [9-8](#)

- SST [B-1](#)
  - ST3 clock [9-7](#)
  - state
    - administrative [B-2](#)
    - card state transitions [B-3](#)
    - cross-connect state transitions [B-5](#)
    - port state transitions [B-5](#)
    - service [B-1](#)
  - static routes [12-7](#)
  - STM1E-12 card
    - description [3-13](#)
    - block diagram [3-13](#)
    - cross-connect compatibility [2-3](#)
    - faceplate [3-13](#)
    - LEDs [3-14](#)
    - port status [3-14](#)
    - software compatibility [3-4](#)
    - specifications [A-16](#)
    - temperature range [A-6](#)
  - STM-N cards
    - See also* individual card names
    - in-service card upgrades [11-31](#)
    - in-service span upgrades [11-31](#)
    - path trace [10-15](#)
    - power requirements [A-5](#)
    - temperature range [A-7](#)
    - timing [9-7](#)
  - storage access networking. *See* FC\_MR-4 card
  - STP. *See* Spanning Tree Protocol
  - string [10-15](#)
  - subnet
    - CTC and nodes on different subnets [12-3](#)
    - CTC and nodes on same subnet [12-2](#)
    - multiple subnets on the network [12-6](#)
    - using static routes [12-7](#)
    - with Proxy ARP [12-4, 12-5](#)
  - subnet mask
    - 24-bit [12-24](#)
    - 32-bit [12-24](#)
  - access to nodes [12-8](#)
  - destination host or network [12-23](#)
  - subnetwork connection protection rings. *See* SNCP
  - subtending rings [11-26](#)
  - switching, revertive [7-3](#)
  - Sw-LCAS [6-4, 10-23](#)
  - synchronization status messaging. *See* SSM
- 
- ## T
- tabs
    - overview [8-6](#)
    - card view [8-14](#)
    - network view [8-12](#)
    - node view [8-10 to 8-11](#)
  - TCC2 card
    - card view [8-13](#)
    - cross-connect compatibility [2-3](#)
    - database backup [8-15](#)
    - description [2-4](#)
    - faceplate [2-5](#)
    - fan speed control [1-14](#)
    - functionality [2-6](#)
    - installed software [8-1](#)
    - LEDs [2-6](#)
    - network-level LEDs [2-10](#)
    - ports [12-25](#)
    - soft reset [8-15](#)
    - software compatibility [2-2](#)
    - software installation overview [8-3](#)
    - specifications [A-8](#)
    - temperature range [A-6](#)
  - TCC2P card
    - card view [8-13](#)
    - cross-connect compatibility [2-3](#)
    - database backup [8-15](#)
    - description [2-7](#)
    - faceplate (figure) [2-8](#)
    - functionality [2-8](#)



- installed software [8-1](#)
- LEDs [2-9](#)
- ports [12-25](#)
- soft reset [8-15](#)
- software compatibility [2-2](#)
- specifications [A-8](#)
- temperature range [A-6](#)
- third-party equipment [1-1, 10-10](#)
- thresholds
  - MIBs [14-23](#)
- timing
  - BITS. *See* BITS
  - parameters [9-7](#)
  - pin connections [1-14](#)
  - report [9-7](#)
  - specifications [A-3](#)
- TLS. *See* VLAN
- traffic
  - monitoring [10-15](#)
  - routing [12-23](#)
- traffic switching
  - multicard EtherSwitch [14-10](#)
  - single-card EtherSwitch [14-11](#)
- transponder mode
  - diagram [14-6](#)
  - for G-Series [14-5](#)
  - G-Series card characteristics [14-9](#)
  - one-port bidirectional [14-8](#)
  - two-port bidirectional [14-7](#)
  - two-port bidirectional G-Series card (diagram) [14-7](#)
  - two-port unidirectional [14-8](#)
- tunnels
  - bidirectional low-order [10-21](#)
  - DCC [10-10](#)
  - IP encapsulated [10-11](#)
- two-fiber MS-SPRing. *See* MS-SPRing

---

## U

- unassigned secondary service state [B-2](#)
- unicast [14-1](#)
- Unlocked,automaticInservice administrative state [B-2](#)
- Unlocked administrative state [B-2](#)
- Unlocked-disabled service state [B-1](#)
- Unlocked-enabled service state [B-1](#)
- user. *See* security
- user data channel [2-20](#)
- user-defined alarms
  - See* external alarms and controls
  - alarm contact installation. *See* alarm pin fields (contacts)
- user setup [9-1](#)

---

## V

- VCAT, non-LCAS states [10-23](#)
- views. *See* CTC
- virtual links [12-21](#)
- virtual local area network. *See* VLAN
- virtual rings [11-30](#)
- VLAN
  - number supported [14-13](#)
  - spanning tree [14-17](#)

---

## W

- WAN [12-1](#)
- warning information [1-xxxii to ??](#)
- west port [11-12](#)
- workstation. *See* computer
- workstation requirements [8-3](#)

---

## X

- XC10G card
  - capacities [10-9](#)

- card view [8-13](#)
  - cross-connect compatibility [2-3](#)
  - cross-connect matrix [2-11](#)
  - described [10-9](#)
  - description [2-10](#)
  - faceplate [2-11](#)
  - LEDs [2-12](#)
  - overview [2-10](#)
  - software compatibility [2-3](#)
  - specifications [A-9](#)
  - temperature range [A-6](#)
- XC-VXL-10G card
- card view [8-13](#)
  - cross-connect compatibility [2-3](#)
  - cross-connect matrix [2-13](#)
  - described [10-10](#)
  - description [2-12](#)
  - faceplate [2-13](#)
  - LEDs [2-14](#)
  - software compatibility [2-3](#)
  - specifications [A-10](#)
  - temperature ranges [A-6](#)
- XC-VXL-2.5G card
- card view [8-13](#)
  - cross-connect compatibility [2-3](#)
  - cross-connect matrix [2-15](#)
  - described [10-10](#)
  - description [2-14](#)
  - faceplate [2-15](#)
  - LEDs [2-16](#)
  - software compatibility [2-3](#)
  - specifications [A-10](#)
  - temperature ranges [A-6](#)